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CONTENTS

SYMPOSIUM ON DISEASES OF THE GALLBLADDER

The following clinics are included in this Symposium

CLINIC OF DR. JOHN E. SUTTON, JR.

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THE DIAGNOSIS OF CHRONIC CHOLECYSTITIS AND CHOLELITHIASIS

DURING the past decade one of the principal advances in the diagnosis of gastro intestinal disease has been the recognition of gallbladder disease as the major cause of chronic indigestion. After middle age definite pathological changes in the biliary system, of which the gallbladder is a diverticulum, are very frequent. Disease of the gallbladder when once established does not long remain confined to that viscus but extends to the associated biliary ducts and even to the liver. It has been estimated by various authorities that between 25 and 50 per cent of all people over forty years of age suffer from functional or structural disease of the biliary system. Women are affected more often than men in the proportion of three or four to one, and of all persons suffering from gallbladder disease about 70 per cent are women who have borne children. This disease is not confined to patients of any particular physical type, blonds and brunettes are affected, the short and the tall, the fat and the lean also suffer and gallstones may occur at any age. Although cholelithiasis has been described in the newborn a number of times and the condition has been reported in unborn children, the usual period of life in which chronic cholecystitis and cholelithiasis occurs is after forty. The exact time of onset of the disease in a given individual is difficult to fix, but reports from several large clinics in this country state that the patients applying for treatment have had definite symptoms for periods averaging from four to six years

The symptoms of chronic indigestion or dyspepsia, so characteristic of gallbladder disease, may be most conveniently described in four groups

In the *first*, the typical biliary colic group, the indigestion is characterized by the recurrence of sudden sharp attacks of cramplike pain located in the epigastrium or in the right subcostal region   These attacks occur suddenly, the pain is agonizing and frequently the use of morphine is necessary to obtain relief   These attacks may be short or they may last for eight or twelve hours   Nausea alone or nausea and vomiting frequently occur during the attack, a temperature rise to 100° or 101° F is not uncommon, but there is little elevation of the leukocyte count   The pain may remain in the epigastrium or in the right subcostal region but it frequently radiates to the back and is felt in the region of the angle of the right scapula, in the interscapular region, or high, posterior to the right shoulder   Boas has emphasized the importance of a tender area in the back just to the right of the tenth dorsal spine   The pain usually goes as suddenly as it came and all that remains of the episode is a soreness of the skin and abdominal wall of the right upper abdominal quadrant

In the *second* or typical biliary or bilious group there are no cramps or attacks of colic but low-grade fever, nausea and vomiting are prominent features   Epigastric sense of weight, a feeling of fulness or actual upper abdominal distention and gaseous eructation are persistent symptoms

The *third* or gastric group present symptoms resembling those of peptic ulcer in so far as the pain recurs in definite time periods after meals and is relieved by more food or by alkali

A mixture of symptoms is found in the *fourth* group These patients suffer from biliary colic, cramps, dull heavy epigastric distress immediately or hours after eating, typical peptic ulcer pain, fever, nausea, vomiting so that no group classification can be made   Frequently during one attack the symptoms may be those of biliary colic while in subsequent

attacks the symptom complex may fall into other groups Very often in the periods between attacks there is persistent epigastric discomfort, belching of gas and upper abdominal sense of heaviness

In the first and second groups the attacks are often precipitated by the eating of specific foods, such as, fats, fried foods, pastry, and certain raw fruits   This qualitative indigestion is of great importance in evaluating the symptoms for accurate diagnosis   In the gastric group we have quantitive indigestion, food of any kind is followed by the occurrence of pain which in turn is relieved by the same food   There is no real periodicity of attacks in gallbladder disease   Weeks, months or years may intervene between early attacks   As the disease progresses and becomes well developed attacks recur at shorter intervals

The history is of the utmost value in dealing with these patients and is of greater importance than any other single factor   The story of protracted indigestion, and irregular gastric disorder, tenderness and pain in the region of the gallbladder during and immediately following an acute attack is a significant combination   Although attacks are frequently initiated by indiscretions in diet they may occur without apparent cause, follow fatigue, excitement or physical exertion   Occasionally an unexplained high interscapular backache antedates by considerable time the development of a characteristic attack

Physical examination should be complete especially in view of the number of diseases which may simulate gallbladder disease   During an acute attack of biliary colic the obvious agony, the shallow respirations, muscular spasm and acute tenderness in the region of the gallbladder and the increase of the pain on deep inspiration gives us a typical picture.   After the acute paroxysm aside from the residual soreness and hyperesthesia in the right hypochondrium there may be little evidence of disease

Jaundice is not found in uncomplicated chronic cholecystitis with cholelithiasis is either during an acute attack or dur

ing quiescent periods The development of jaundice depends upon the obstruction of the extrahepatic bile ducts by a stone or by several stones Obstructive jaundice is, therefore, a complication of cholelithiasis and should never be considered as one of the primary signs Obstructive jaundice contraindicates cholecystography The gallbladder, in this condition, being always completely filled with bile receives little if any of the dye, and toxic symptoms have been reported after the administration of the dye in the presence of an obstructed common bile duct

Laboratory procedures are of importance and x-ray examinations give us much valuable information No examination of a patient suspected of having gallbladder disease is complete without a cholecystogram, using the Graham dye, and a gastro-intestinal series The cholecystogram gives definite evidence as to the condition of the gallbladder and the gastrointestinal series rules out or confirms complicating diseases of the alimentary tract which confuse our diagnosis The coexistence of chronic cholecystitis with cholelithiasis and duodenal ulcer occurs in about 10 per cent of these patients

The success of our cholecystogram depends upon (1) Absorption of the dye from the gastro-intestinal tract (or intravenous administration of the dye), (2) excretion of the dye with the bile by the liver, and (3) the entrance of the dye laden bile into the gallbladder through the cystic duct The dye which has thus entered the gallbladder becomes concentrated and being radiopaque casts a shadow of the gallbladder upon the film Regular contour, uniform density and prompt disappearance of the shadow after a fat meal suggests a normally functioning gallbladder Irregular contour, mottling or lack of uniform density, a faint shadow and slow disappearance of the shadow after a fat meal indicates disease of the gallbladder The demonstration of the shadow of the gallbladder in this test depends upon the entrance of the dye in the bile through the cystic duct If the cystic duct is obstructed by a stone, by fibrous contraction of the duct or by inflammatory reaction in its wall or lumen, bile cannot

pass into the gallbladder and there will be no shadow of the gallbladder However, absence of the shadow is not conclusive proof of cholecystic disease, vomiting soon after swallowing the dye or failure of absorption by the gastro-intestinal tract will many times account for the failure to visualize the gallbladder In the event of finding no gallbladder shadow on the film the test should be repeated with proper attention to the known criteria for successful cholecystography On the other hand, apparently normal cholecystograms may be obtained when the gallbladder is grossly diseased and even when it contains many stones As with all laboratory procedures this test should be viewed as a part of the study and not as the pinnacle upon which our diagnosis rests or from which it may fall

The diagnosis of cholecystic disease is often difficult and frequently taxes the physician's ability and judgment to the uttermost. Many conditions such as (1) Acute perforation of a duodenal ulcer, (2) chronic duodenal ulcer and gastric carcinoma, (3) acute pancreatitis, (4) acute intestinal obstruction, (5) Dietl's crisis and pyelitis, (6) gastric crises of tabes dorsalis, (7) intercostal neuralgia, (8) root pains of spinal arthritis, (9) irritable colon and colitis, (10) psychopathic personality, and (11) angina pectoris, resemble in some of their manifestations disease of the gallbladder While these diseases many times resemble in symptomatology gallbladder disease we always bear in mind the fact that gall stones may also be present and that these gallstones may not be responsible for the active symptoms Although many of the atypical symptoms of gallbladder disease are to be discussed in detail in another part of this symposium, brief reference may be made to them here.

An acute perforation of a duodenal ulcer when seen *early* usually gives a typical history and classical physical findings The sudden knifelike epigastric pain, boardlike rigidity of the abdomen absence of abdominal respiratory movements, immobility of the patient with the thighs flexed, normal or sub normal temperature slow pulse, high leukocyte count and the

fluoroscopic demonstration of gas under the diaphragm clinch the diagnosis

The routine gastro-intestinal series, if carefully done and properly interpreted, will rule out gastric or duodenal ulcer and carcinoma of the stomach

In acute pancreatitis the pain is in the midline low in the epigastrium and extends to the left under the left rectus muscle It is severe, steady and radiates straight through to the back The patient is in shock with rapid thin pulse and a high leukocyte count His face is pale with a suggestion of cyanosis Abdominal rigidity extends across the upper abdomen and tenderness is present in this whole area Early in the disease hyperglycemia is present

Acute intestinal obstruction is characterized by generalized abdominal pain which recurs rhythmically During the paroxysm of pain tumultous peristaltic sounds are heard The gas gurgles and bubbles violently and often a peculiar metallic tinkle is heard With the subsidence of the pain the peristaltic sounds disappear Then after a short period of time the cycle is repeated Failure of enemata and colonic irrigations to return flatus is very important Fecal return or even the passage of a well-formed stool may occur when irrigations or peristalsis empties the gut of its solid contents *below* the point of obstruction The lowering of the blood chlorides and the demonstration of gas with or without fluid levels in the small intestines usually complete the diagnosis

Dietl's crises and pyelitis, when the right kidney and ureter are involved, frequently resemble the symptomatology of gallbladder disease The acute costovertebral tenderness and careful bimanual palpation is of the utmost importance to discover a tender kidney At times repeated urinalyses shed no light on the actual condition and one must resort to x-ray examinations of the kidneys and ureters, cystoscopy, and pyelography

In the gastric crises of tabes dorsalis we may have symptoms which mimic any acute abdominal condition or the symptoms are subacute and other chronic diseases are simulated

In differentiating abdominal symptoms of lues and those of gallbladder disease our history plays an important part. The history of the primary lesion, secondary skin rashes, miscarriages, and other manifestations of luetic infection should be obtained at the first visit. The lightning pains of tabes have been considered to be "rheumatic." Our complete physical examination yields incomplete information on many occasions but alterations in the gait and station, fixation of the pupils, irregularity of the pupils, sluggish reaction of the pupils, loss or inequality of the reflexes of the extremities are important points to be noted.

Intercostal neuralgia frequently imitates the symptoms of chronic gallbladder disease in that the pain is referred to the right subcostal region in a manner very similar to the pain of chronic cholecystitis. Tenderness is also present but the tenderness is in the abdominal wall and there are sharply localized points of tenderness at the tips of the ninth and tenth ribs. Firm palpation in the intercostal spaces along the courses of the intercostal nerves will elicit pain or tenderness. The pain is also not that of the dyspepsia so characteristic of gallbladder disease.

Root pains of spinal arthritis, although they confuse the picture at times, should not seriously complicate the diagnosis. Stiffness of the back, spasm of the deep muscles and the characteristic x ray films of the spine save us from possible error.

Mucous colitis, spastic colitis, and irritable colon are at times very confusing. A careful consideration of the history with special reference to bowel habits is imperative. Irregular stools containing variable amounts of mucus, often streaked with blood are presumptive evidence of mucous colitis. Irritable colon with its watery, poorly formed and small stools sometimes complicates the picture. In this condition we often have loose stools soon after arising as the principal symptom. x Ray examination of the colon in the course of the routine gastro-intestinal series or after a barium enema often yields valuable information. The use of the procto-

scope should not be an after-thought or a measure of last resort   Many times the diagnosis of apparently obscure conditions can easily be made by this simple procedure

A careful psychiatric examination will frequently be of distinct advantage   Many times patients with psychopathic bases present definite and clear-cut gastro-intestinal syndromes   A personal experience several years ago illustrates this point   A young woman with a typical history of cholecystic disease was referred for cholecystectomy   Her cholecystogram showed deformity of the gallbladder shadow and a suggestion of mottling   At operation the gallbladder and all other abdominal organs were found to be normal   After five days of postoperative comfort an emotional strain precipitated a typical attack of colic which, however, was transferred to the left side of the abdomen   Subsequent psychiatric treatment cured this patient

Symptoms of certain cardiac diseases and the paroxysms of pain in gallbladder disease are frequently confusing Marked cardiac disturbance may occur during an attack of biliary colic, with weak pulse, cyanosis, signs of collapse, fibrillation, tachycardia or heart block   Acute distention of the ducts of the biliary tree will produce precordial pain of a pseudo-anginal nature   In attacks of pain with true coronary disease biliary colic may be closely simulated   In these difficult conditions due consideration must be given to the physical status of the patient, to the cardiac reserve, to the electrocardiogram, and to the relation of physical exertion and excitement as precipitating factors in the attack

The diagnosis of chronic cholecystitis and cholelithiasis is often difficult but the very nature of the disease usually makes deliberate study possible   There is seldom a state of emergency   A carefully taken, well considered history is of the utmost importance, protracted indigestion is the keynote Careful physical examinations and the intelligent use of our laboratory aids complete the study   Accurate diagnosis is our surest guarantee of successful therapy

CLINIC OF DR. I W HELD

Beth Israel Hospital

GALLBLADDER DISEASE WITH ATYPICAL SYMPTOMS, INCLUDING BILIARY DYSKINESIA

Gallbladder disease with a history of biliary colic is easily diagnosticable   In these cases, there is not only no need for a complicated laboratory examination, but very often the physical examination, if positive, tends only to confirm the diagnostic conviction derived from the history   Even negative physical findings do not alter our opinion

In looking back through our clinical experience, however, it becomes apparent that there is a large percentage of cases in whom neither past history nor existing symptoms have sufficed to establish diagnosis   Moreover, in many instances the symptoms direct attention to other organs so that clinical investigation of the gallbladder and extrahepatic biliary ducts is entirely ignored

When, in the course of events, the true condition is recognized, it is customary to refer to such a case as one with atypical symptoms   The symptoms are called "atypical" because we have accustomed ourselves to a classical description of almost every disease, forgetting that everyday experience teaches that the orthodox description corresponds to only a small percentage of cases   It is the rule that when any organ of the body is acutely diseased, the symptoms point directly to the affected organ   Hence in acute diseases, diagnosis is generally not very difficult   When, however, an organ is chronically affected there are dormant stages, and even when symptoms do exist only too often do they point away from the seat of the disease   Again, it may be said that when an organ is acutely diseased functional disturbances are often far out of proportion to the existing path

ology   On the other hand, a chronically diseased organ may have a maximum of pathology with a minimum of functional disturbance because it has had an opportunity to accommodate itself by virtue of its own reserve, as well as to derive the benefit of the compensatory accommodation offered by allied organs

It is well known that pathologic function is not always equal in the presence of disease, no organ being excepted   For instance, a colonic disturbance can give rise to constipation in one patient, and to diarrhea in another, without any difference in degree of pathology   The heart, stomach, and kidneys, too, with exactly the same degree of pathology in different patients, may give rise to functional disturbances of wide variety   An understanding of pathologic function is essential, therefore, if one is too interpret symptoms correctly, particularly those that are atypical

The atypical symptoms of gallbladder disease may be classified as follows

1 Extra-abdominal symptoms only
    (a) Shoulder pain
    (b) Vertigo
    (c) Cardiospasm
    (d) Angina pectoris
    (e) Arrhythmia
2 Intra-abdominal symptoms, pointing conspicuously away from the gallbladder
    (a) Gastric—secretory, sensory and motor
    (b) Colonic—secretory, sensory and motor
3 Predominant symptoms of chronic pancreatic disease
4 Metabolic disturbances
5 Symptoms of a general infection (cholangitis and cholecystitis lenta)
6 Functional disturbances without demonstrable pathology in the gallbladder
    (a) Disturbances in biliary secretion
    (b) Disturbances in biliary absorption
    (c) Disturbances in motility (dyskinesia)

In the discussion to follow, our procedure will be to exemplify the manner in which the gallbladder disease masquerades under various symptoms by utilizing cases wherever possible with an analysis of the variations presented

EXTRA-ABDOMINAL SYMPTOMS ONLY

Pain in the Right Shoulder —A physician in his fifties came to us complaining of severe, periodic, nonradiating pain in the right shoulder, intensified by the slightest motion He had had his teeth removed because he thought his pain might be due to arthritis as a result of focal infection After that, he visited a spa annually where he found sufficient relief to convince him that the pain was rheumatic in nature The diagnosis was not clarified until suddenly he experienced an attack of intense pain in the epigastrium and upper right quadrant, accompanied by an elevation of temperature There was also aggravated pain in the right shoulder From the clinical evidence pointing to surgical disease of the gall bladder, a diagnosis was made of purulent or gangrenous cholecystitis

Operation disclosed a calculous gangrenous gallbladder There were stones also in the cystic duct The patient made a complete recovery and, after the operation, had no further pain in the right shoulder While convalescing, he was asked if he had not experienced some digestive disturbance, where-upon he confessed that he had often felt bloated after meals, but being a heavy hasty eater he had always attributed this distress to his mode of eating

Pain in Both Shoulders —An example of pain in both shoulders is the case of a man in middle life, related to us by Dr Arnold Galambos The patient complained of pain in the right and sometimes in the left shoulder, severe enough at times to interfere with work In his late fifties he developed urinary bladder symptoms due to an hypertrophied prostate and a prostatectomy was performed For several weeks, he was in excellent condition except for his unabating shoulder pain Then he developed an acute attack of biliary colic necessitating surgical intervention Operation disclosed a chronically infected gallbladder filled with stones After this was removed the shoulder pain completely disappeared

Discussion —The inclination to attribute shoulder pain that is cured or improved by removal of a diseased gallblad

der to that gallbladder as a focus of infection is understandable   However, this does not seem to be an entirely satisfactory explanation   When focal infection causes symptoms in the joints, it is usually in the mobility of the joints   In addition, there is a tendency to actual interference with motion of the joint because of definite organic changes in the joint which persist even after removal of the focus   When there is shoulder pain in gallbladder disease, however, motion is interfered with only during the time of pain   That is, the moment the pain disappears the patient can move his joint freely, indicating the purely neuralgic nature of the pain   The result of phrenic nerve irritation   This nerve carries both sensory and motor fibers   Once irritated by any existing cause, the sensory fibers continue to be disturbed until that cause is removed   That such phrenic nerve irritation is a factor is further evidenced by the fact that when there is no persistent pain in the right shoulder or right scapular region, the acute pain during an attack of biliary colic usually radiates to this region   Even in the absence of colic, tenderness can usually be elicited by slight pressure over the right humeroclavicular joint (Westphal sign)

An explanation of phrenic nerve irritation is offered by Head and also by Lange as follows   The afferent impulses from a hollow viscus which itself is not sensitive to pain are carried through centripetal sensory fibers which lie in the vagus to the vagus nucleus in the medulla oblongata and thence back to the sensory spinal nerves for distribution to areas supplied by those spinal nerves

Vertigo —A woman in the mid-fifties presented herself with the sole complaint of attacks of vertigo or dizziness, occasionally followed by vomiting   Because of the vomiting, she thought her digestive organs were at fault   During her attacks she would become so pale as to give the impression of Ménière's syndrome   She had no gastric symptoms during the intervals between vertigo attacks and gave no history to indicate gallbladder disease   In view of the absence of an acceptable explanation of the vertigo, and because in

some cases vertigo or Ménière's complex is the only symptom of gallbladder disease, the gallbladder was examined roentgenographically on two occasions using the Graham dye On neither did the gallbladder fill The symptoms persisted and operation was advised At operation, cholecystitis with cholelithiasis was found After removal of the gallbladder, the vertigo and vomiting disappeared spectacularly

Discussion—Vertigo with accompanying vomiting or nausea in gallbladder disease is explainable on the basis of reflex irritation of the vestibular nerve which is a branch of the vagus nerve Von Bergmann[1] calls the condition *vertigo e vesica fellea laesa*, or "gallbladder vertigo" analogous to the "gastric vertigo" described by Kussmaul

Cardiospasm—Occasionally, cases of gallbladder disease are encountered in whom the predominant symptoms are those of cardiospasm Whether persistent or intermittent, this cardiospasm is so distressing that unless the one afflicted is questioned most rigidly regarding all other symptoms the underlying cause may easily be overlooked

When gallbladder disease is the cause of cardiospasm, diagnosis is of the utmost importance because removal of the gallbladder may effect a cure provided it is removed before the cardiospasm has caused marked dilatation and atony of the esophagus Mosher[2] has shown that gallbladder disease is a relatively common cause of infection of the esophagus, thus furnishing an anatomical basis for esophageal symptoms, particularly cardiospasm

One case of this nature was a woman in the fifties who for several years had suffered from cardiospasm which, in the beginning, was intermittent so that she had some weeks during which she could partake of food Then the symptoms throughout a period of several months became progressively worse Roentgen examination revealed definite evidence of cardiospasm History revealed that during her earlier years, soon after giving birth to her first child, she was subject to attacks of biliary colic. After the age of thirty these ceased entirely Physical examination was essentially negative ex

cept for a palpable, though not tender, right lobe of the liver   Roentgen examination after the administration of the Graham dye, which had to be given intravenously because of the cardiospasm, showed a failure of the gallbladder to take up the dye   So the patient was advised to have her gallbladder removed   Operation revealed chronic cholecystitis with cholelithiasis   After the gallbladder was removed, the symptoms of cardiospasm disappeared gradually, and have not returned in the ten years since operation

Within a short time this case was followed by another similar in nature, again a woman of middle age   The fluoroscopic examination did not reveal as high a degree of cardiospasm as in the previous case, but repeated examination proved the complaints of cardiospasm to be entirely justifiable   There was considerable delay in the passage of food from the esophagus into the stomach, with dilatation above the spastic area   In this case, too, there was a history of attacks of biliary colic several years before   So we investigated the gallbladder by means of the Graham dye   This was given by mouth on two occasions and each time the gallbladder failed to take it up   Because of the successful result in the former case, we advised operative interference   An inflamed stone-containing gallbladder was removed, followed by complete relief of the cardiospasm

Discussion —There seems to be little doubt that the most important controlling factor in the causation of cardiospasm is a reflex disturbance in the balance of the vegetative nerves innervating the esophagus   In both of our patients, there was definite evidence of such imbalance

Angina Pectoris —In a somewhat larger group of cases, symptoms of angina pectoris even to the point of simulating coronary thrombosis are outstanding with gallbladder symptoms entirely in the background   In view of the fact that these symptoms usually occur in individuals past middle life, the diagnosis may long be directed toward coronary artery disease with the gallbladder entirely overlooked   The patient experiences sudden severe pain in the epigastric region

radiating to the precordium, left arm and to the fingers of the left hand This pain is excruciating and is accompanied by a sensation of inability to breathe The lips, tip of the nose, and sometimes also the cheeks are moderately cyanotic. The patient is almost in collapse with cold perspiration and rapid pulse Cardiac irregularity in the form of extra systoles or even auricular fibrillation is sometimes present. Quite often the attack is followed by elevation of temperature, which strengthens the suspicion of coronary thrombosis If neither jaundice nor enlargement of the gallbladder is present, one remains in doubt as to the exact diagnosis It is to be remembered however, that coronary thrombosis, especially of the right coronary artery, often gives rise to a moderate degree of jaundice, and invariably to tenderness and enlargement of the liver so that an erroneous diagnosis may be made of gallbladder disease when in reality coronary thrombosis is the underlying cause of the symptoms Occasionally, cardiac failure, particularly right-sided heart failure, following coronary thrombosis with congestion of the liver leads to biliary stasis in the common duct and gallbladder, causing infection of these organs and giving rise to associated true biliary colic, and even to suppuration of the gallbladder

We refer here especially to cases where gallbladder disease causes not only acute attacks simulating angina pectoris or coronary thrombosis necessitating morphine, but also, in the interim between acute attacks, effort angina of a milder degree and angina pectoris following a heavy meal Diagnosis is especially difficult if the collapse manifestations, namely, persistent low blood pressure and a very rapid or a very slow pulse, persist despite the fact that morphine has relieved the acute symptoms of pain Positive electrocardiographic findings of course, establish the diagnosis of coronary thrombosis

Two possibilities exist regarding the cause of these attacks One is that there is actually a associated pathology, if only of minor degree, in the coronary vessels that is activated by gallbladder infection This explanation is reason

able because the occurrence of the symptom is usually present in individuals of middle age in whom some degree of coronary artery disease is not unusual

The second explanation, however, is by far the more plausible This is that there is a disturbance in the viscero-sensory reflex Irritation of the spinal nerve is caused by the diseased gallbladder and this irritation is carried to the sensory plexus supplying the aorta and coronaries, thus bringing about pain simulating angina pectoris Here, too, one may apply the law of Head which he expresses as follows "When a painful stimulus is applied to a part of low sensibility, in close central connection with a part of much greater sensibility, the pain produced is felt in the part of higher sensibility" This displacement of sensation Head calls "allocheiria"

Of the many cases of this nature that we have seen two are particularly interesting

One particularly instructive case is that of a well-nourished man in the middle sixties For a number of years he had complained of epigastric distress and belching, particularly after a heavy meal There was no absolute pain Then, in the summer of 1927, he had a very severe attack of epigastric pain with radiation to the precordium and left arm, which was diagnosed as coronary thrombosis Repeated electrocardiographic tracings, however, were negative In view of the attack, however, he was kept in bed for six or eight weeks, after which he developed pain of moderate degree on effort He commenced taking nitroglycerin because it gave some relief

In January, 1935, he experienced another very severe attack of epigastric pain, radiating to the precordium with a sensation of inability to breathe The blood pressure during the attack was 140/90 The pulse was rapid and relief was afforded only after two doses of morphine, 0 03 Gm Two days later moderate jaundice appeared, with bilirubin and urobilin present in the urine The right lobe of the liver became palpable and tender The jaundice and liver tenderness continued for ten days, disappeared and recurred several weeks later

Electrocardiograms were negative A diagnosis of common duct obstruction by calculus was made and confirmed roentgenographically, but, owing to the patient's condition, operation has not been advised

The question arises whether in these cases the attacks of angina pectoris are the result of the gallbladder as a focus of infection In view of the fact that it has long been recognized that both gallbladder disease and angina pectoris may coexist, it was assumed in some clinics that the reason for the angina pectoris lay in the fact that the gallbladder is actually a focus of infection Furthermore that in true angina pectoris, where there is no cause to suspect coexisting gallbladder disease, removal of the gallbladder, it was thought, might cure the angina pectoris This practice was carried out for a time, but fortunately has been abandoned by most clinics as a very dangerous one and not productive of the desired result

An example of a case operated on the basis of this theory is a physician who in his forties had his first attack of precordial pain while playing golf Several days later he presented signs of myocardial failure evidenced by dyspnea and slight edema of the ankles, which, however, disappeared after he had remained in bed two or three days A few weeks later, while on the train going away for a holiday, he suffered a severe attack of epigastric pain, so severe that he had to be removed from the train and given morphine

In view of the nature of the pain, its location, and a history of typhoid fever some years before, the suspicion occurred both to the physician patient and his attending physician that he was suffering from gallbladder disease With this diagnosis, he returned to New York and continued to suffer from angina pectoris attacks on slight exertion though he was not decompensated between attacks The electrocardiographic examination remarkably enough was negative

About this time articles began to appear in the literature speculating on the relation of gallbladder disease to angina pectoris The patient went to the Mayo Clinic, where

after careful study, it was decided to remove the gallbladder in spite of the coexisting angina pectoris The gallbladder was found to be normal and the patient continued to suffer from his attacks of angina pectoris Within a year he succumbed to thrombosis of the coronary artery

Regarding the indications for surgical intervention in cases where the symptoms of angina pectoris are directly due to gallbladder disease, surgery should be carried out by all means if there is very little objective evidence of coronary artery disease, that is, if the heart is normal in size and rhythm, and there are no abnormal electrocardiographic changes However, where there is definite evidence of coronary artery disease, even if the clinical examination, including the roentgen findings, makes it certain that gallbladder disease is also present, the patient should receive palliative treatment for the gallbladder condition and be operated only when there is an absolute surgical necessity such as acute infection of that organ or of the large biliary ducts, particularly if there is a suspicion of suppuration or impending perforation

Arrythmia —Disturbance of cardiac rhythm with or without precordial pain appears very rarely in gallbladder disease When it does, the symptoms are usually so in the foreground as to mask entirely the gallbladder condition The onset is marked by epigastric distress, belching or vomiting, followed immediately by paroxysmal auricular fibrillation with considerable pulse deficit and slight shortness of breath If the fibrillation persists for several days, definite evidence of cardiac failure, as congestion of the lung and slight enlargement of the liver, manifests itself In most cases the paroxysmal auricular fibrillation subsides abruptly and normal rhythm is reinstated, followed by recession of the congestion of the lungs and enlargement of the liver In some instances, however, slow auricular fibrillation persists for several weeks, or there may be attacks of paroxysmal auricular fibrillation several times in the course of the week, unaccompanied by epigastric distress or accompanied at most by very slight gastric symptoms

A striking example of disturbance in rhythm is a male patient who suffered for many years from attacks of epigastric distress These would occur almost monthly, confining him to bed They were accompanied by moderate enlargement of the liver and paroxysmal auricular fibrillation Between attacks he was very comfortable He had a good appetite and would quickly regain whatever weight he may have lost. Eventually, however, he had a very severe attack which was followed by hydrops of the gallbladder He was admitted to Beth Israel Hospital with a diagnosis of biliary colic and hydrops of the gallbladder, but because of the cardiac symptoms surgical intervention was not dared Then, as the attacks continued, he went finally to the Mayo Clinic and there a gallbladder filled with stones was removed In the many years since his operation he has remained entirely well, except for an attack of slight epigastric distress a few years ago This was followed by a period of auricular fibrillation, less severe than preceding attacks and lasting only a few hours The patient is now in the fifties, is very active and entirely well

Discussion —The cause of cardiac arrhythmia may be rightfully attributable in some cases to gallbladder infection since infection in any part of the body may be responsible for cardiac arrhythmia It is very difficult to accept gallbladder infection however, as the only causative factor It seems to us that inasmuch as gallbladder infection is so frequent and cardiac arrhythmia so rare in individuals having disturbance in cardiac rhythm secondary to gallbladder infection, there must be a locus minoris resistantiae either in the innervation of the heart or in the cardiac structures influencing conductivity of the heart

INTRA ABDOMINAL SYMPTOMS POINTING CONSPICUOUSLY AWAY FROM THE GALLBLADDER

We come now to a group of cases where the symptoms though mainly gastro intestinal point conspicuously away from the gallbladder tract These symptoms may be divided into

two groups, gastric and colonic, and each of these in turn may be subdivided into secretory, motor and sensory disturbances

Gastric Secretory Disturbances—A journalist in the forties, unusually well built and to all appearances in excellent health, without nervous symptoms and with an excellent appetite so that he did not have to forego any kind of food, had only one complaint, namely, bloating and pressure in the epigastrium after meals Repeated gastric analyses revealed no free acid and a very low total acidity As this was before the era of the Graham test for gallbladder disease, the patient was considered to be suffering from gastric anacidity and was treated accordingly but without benefit Eventually he became so annoyed that he delivered himself to charlatans and became a faddist in methods of diet, going so far as to undertake a twenty-one day fast for a "cure" On the nineteenth day, however, he went into collapse and had to be sustained by enteroclysis of 10 per cent glucose solution and hypodermoclysis of normal saline solution, until he could resume eating by mouth Then, when he had returned to his full health and was eating everything once more his original symptoms returned This time he resigned himself to his fate and attended to his work until one morning he ate a meal in a certain restaurant, partaking of huckleberry pie which contained arsenic accidentally mixed with the flour One of several unfortunate victims, he died within twelve hours Th coroner's autopsy revealed, among other findings, a large inflamed gallbladder containing stones The failure to make tl diagnosis of gallbladder disease in such a case today would be inexcusable because wherever digestive symptoms occur roentgen study should always include an examination of the gallbladder by means of the Graham test

In some cases of secretory disturbance due to gallbladder disease there is almost continuous pyrosis, only partially relieved by bicarbonate of soda There is also regurgitation of sour fluid and a persistent burning under the esophagus Even though the gastric contents show only a moderate increase in gastric acidity, symptoms of hyperacidity predomi-

nate   In still other cases actually demonstrable hyperacidity exists, giving rise to like symptoms, of intensified degree

Some observers have stated that hyposecretion or anacidity is most often present when gallbladder disease influences gastric secretions   Others, again, offer statistics to prove that hypersecretion is more often encountered   Our experience has been that gastric acidity is normal in the vast majority of cases   If tendency there is, it is toward hypoacidity   However, it is not the degree of gastric acidity that is responsible for the symptoms   It is associated hyperesthesia of the gastric mucosa   This explains why gastric secretory symptoms are so persistent and why so many of these patients eventually become gastric hypochondriacs   In other words, the secretory disturbances are purely reflex in nature

Gastric Motor Disturbance —Gastric motor disturbance due to gallbladder disease generally manifests itself by delayed emptying of the stomach   It has been our experience that delay in emptying of the stomach is more often encountered in gallbladder disease than in uncomplicated peptic ulcer   This phenomenon corresponds to what Mackenzie terms the viscero-motor reflex   However, in the case of one viscus influencing another viscus in its function, it is more appropriate to speak of a viscerovisceral reflex   In the case of secretory, sensory or motor disturbance, it is a viscerovisceral reflex with an influence on the secretory, sensory or motor apparatus

The delayed emptying in these cases is not due to atony of the stomach because it is encountered also in individuals with an orthotonic or hypertonic stomach

As a general rule, the four hour residue is very moderate in degree and is confined to the pyloroduodenal region   In some cases, however, there is considerably more delay so that even five hours after the barium buttermilk meal one fifth or one fourth of the substance is still present in the stomach   If greater delay is present, differential diagnosis between delayed emptying due to stenosing peptic ulcer and gallbladder disease or between stenosing carcinoma of the stomach and gallbladder disease is most difficult   The latter is especially

true if the pyloric end of the stomach shows persistent spasm resembling the pivot-shaped pylorus of cancer

In a small percentage of cases, motor disturbance manifests itself as hastened emptying of the stomach   This occurs usually in cases with symptoms simulating duodenal ulcer Not only is there hypermotility of the stomach, but also of the small intestines   Three or four hours after the contrast meal very little of the substance is visible in the small intestines, most of it having already distributed itself through the cecum, ascending, transverse and greater part of the descending colon   Occasionally, despite hypermotility, there is a small residue in the stomach (paradoxical residue) causing great difficulty in differentiating between functional disturbance, demonstrated roentgenologically, due to duodenal ulcer and gallbladder disease

Gastric Sensory Symptoms —In perhaps the majority of cases the symptom that brings the patient to the physician is pain in the upper abdomen confined to the midepigastrium or pyloroduodenal region   This pain may be so violent as to require immediate medical aid   Atropine (0 006 Gm) taken under the tongue or given hypodermically is effective in providing quick relief because the pain is due to pylorospasm   In most cases, the pain is less severe and is greatly alleviated by the application of heat with the patient lying down   Sometimes the pain closely simulates the hunger pain of duodenal ulcer, that is, it comes on two or three hours after a meal and is relieved by the taking of food   It awakens the patient toward dawn more often than does the pain of duodenal ulcer, because it is at this time, when the stomach is empty, that the gallbladder is most distended   The characteristic seasonal periodicity of duodenal ulcer is the great exception

Colonic Secretory and Sensory Disturbances —Secretory and sensory disturbances of the colon are usually associated, although occasionally one or the other symptom predominates   They manifest themselves chiefly in the form of colica mucosa, characterized clinically by discomfort in the abdomen, reflex gastric disturbances such as nausea and oc

casional vomiting, and loss of appetite The nausea, vomiting, and distress in the upper abdomen are due to distention of the transverse colon Constipation is obstinate and the colon becomes characteristically almost intolerant to stool so that the patient resorts to laxatives and frequent enemas during the day in order to relieve a sensation of a never-emptied colon With each bowel movement, large shreds of mucosa are evacuated Sometimes these are so thin as to be mistaken by the patient for worms, again they are quite large and long, measuring eight or ten inches in length, not mixed with stool but often covering it Frequently only large clumps of mucus are discharged

The question may be asked whether such colica mucosa is not an independent affection because removal of the gallbladder does not always entirely eliminate the symptoms However cases have been reported where the removal of a diseased gallbladder has permanently cured this unpleasant symptom complex

Colica mucosa, although considered to be a neuropathic disease, may nevertheless be looked upon in some cases as an allergic manifestation Many years ago, Strümpel referred to it as "asthma of the colon" When the condition occurs in gallbladder disease it is probably because the gallbladder acts as a sensitizing agent

Colonic Motor Disturbance —In the great majority of cases colonic motor disturbance manifests itself as constipation Some of the most intractable constipation is encountered in gallbladder disease More rarely, there is spasticity of the sigmoid and descending colon, giving rise to persistent pain over the left side of the abdomen and typical spastic constipation namely pencil like evacuations If a laxative is effective at all it causes very loose movements accompanied by abdominal cramps The colonic symptoms are so in the foreground as to make a diagnosis of neurosis with functional constipation a most plausible one the gallbladder disease being entirely overlooked

CHRONIC CO-AFFECTION OF THE PANCREAS

Although in many cases of gallbladder disease (estimated between 10 and 30 per cent) there is some degree of associated affection of the pancreas, characteristic clinical symptoms of such co-affection are exceedingly rare   This is so because functional disturbances in the internal or external secretions are well compensated by the great reserve possessed by the pancreas   However, when vague digestive disturbances exist —such as distress in the upper abdomen, loss of appetite, and unexplained loss of weight—and when clinical investigation, including the roentgen examination, shows evidence of gall bladder disease, one should suspect co-affection of the pancreas and carry out further clinical investigation to establish the diagnosis   Marked diminution of the pancreatic ferments in the stool and in the duodenal contents are confirmatory   A valuable test, suggested by Katsch,[3] is to introduce into the duodenum 3 to 5 cc of ether   This stimulates pancreatic secretion so that pure secretion may be obtained for chemical examination and has the additional advantage that if pancreatic disease is present the patient experiences pain in the left shoulder while the injection is being made

The diagnosis of co-affection of the pancreas is extremely essential because in many instances removal of the gallbladder has prevented the development of acute hemorrhagic pancreatitis

METABOLIC DISTURBANCES

The discussion of co-existent pancreatic infection leads naturally to a consideration of the disturbances in carbohydrate metabolism that sometimes accompany gallbladder disease Some authors have asserted that this disturbed carbohydrate metabolism may cause true diabetes   This observation is based on the fact that an infection of the gallbladder has more tendency to involve the functions of the body and tail of the pancreas, containing the islands of Langerhans, than to affect the head of the pancreas   This would explain why acute pancreatitis secondary to gallbladder disease is never accompanied by jaundice, often by glycosuria, and almost invariably

by some degree of hyperglycemia and by a high diastase content of the blood

SYMPTOMS OF GENERAL INFECTION (CHOLANGITIS AND CHOLECYSTITIS LENTA)

Cases are occasionally seen where the symptoms are outstandingly those of a protracted, low grade general infection There is moderate elevation of the temperature, slight secondary anemia, loss of weight, loss of appetite and constipation The tongue is coated and the skin is sallow, the sclerae being slightly subicteric. The spleen may be slightly enlarged, the liver is palpable and usually it is tender Frequently there is tenderness over the right humeroclavicular joint This tenderness of the liver and shoulder joint should call one's attention to possible infection of the biliary ducts The urine may contain traces of bile, urobilin and urobilinogen The gallbladder is, as a rule, not visualized with the Graham dye If it is, this does not exclude cholangitis and cholecystitis lenta Diagnosis is greatly aided by a thorough bacteriologic examination of bile obtained by biliary drainage If Streptococcus viridans is directly demonstrable in one or two examinations, or if it grows in large numbers on culture diagnosis is absolute

As long as the infection is confined to the biliary ducts and gallbladder, septicemia does not result If it is allowed to go on, however, so that the patient becomes markedly anemic or exhausted, death may occur due to exhaustion, or it may occur from septicemia as a result of mixed infection with streptococcus hemolyticus or with colon bacillus

The source of Streptococcus viridans cholangitis and cholecystitis lenta (Schottmuller) is as a rule not hematogenous The organism comes from the gastro intestinal tract, where according to Hadjopoulos [*] it acquires its greate t virulence and is most pathogenic It is not a pus producing organism, hence the infected ducts as well as the gallbladder remain chronically inflamed without suppuration

A case that may be quoted is that of a man of forty five

who for many months suffered from vague abdominal pain,
loss of appetite, constipation and coated tongue He ran a
persistent subfebrile course (101° F in the afternoon) His
complexion was sallow and had a subicteric tinge The liver
was large The gallbladder could be only faintly visualized
with the Graham dye The icterus index and bilirubin were
negative Other findings were Cholesterol 200, hemoglobin
70 per cent, red blood cells 3,950,000, white blood cells 6300
Biliary drainage invariably revealed the presence of Strep-
tococcus viridans After biliary drainage and other methods
of treatment, such as complete rest, failed to bring about a
cure, the patient was explored and a chronically inflamed gall-
bladder was removed, from which the pathologist recovered
an abundance of Streptococcus viridans

The only remedy is to remove the gallbladder and drain
the common duct for a period of several weeks Drainage is
most necessary, otherwise stasis results leading to cholangitis
and even to cholangeitis Although the gastro-intestinal
symptoms improve considerably after operation and the pa-
tient regains his appetite, the anemia improves slowly Hence
the patient should be given iron ammonium citrate 0 5 Gm
three times a day and a nutritious diet that is rich in vitamins
and contains a high proportion of carbohydrates Rest for
several weeks in a good climate is also recommended

DISTURBANCES IN GALLBLADDER FUNCTION WITHOUT DEMONSTRABLE PATHOLOGY

Thus far we have discussed affections of the gallbladder in
which the symptoms pointed away from the biliary tract
Now we come to a group of cases where the symptoms point
strongly to the gallbladder and large biliary ducts but with
neither the surgeon nor the pathologist being able to demon-
strate actual pathology if the patient comes to operation In
other words, the symptoms are due to a disturbance in func-
tion that continues even after operation, sometimes more
severely than before

The growing realization that functional disturbances of the

gallbladder and large biliary ducts may give rise to symptoms as severe as any that are caused by pathologic changes in these organs is largely the result of the physiologic studies of Westphal[6] in Germany and Ivy[6] in this country   To understand disturbed function it is, of course, necessary first to appreciate the normal function of the gallbladder and large biliary ducts   Briefly, the three main normal functions are (1) Secretory, (2) absorptive, and (3) motor   In the presence of pathology in this region, all three functions are generally disturbed, varying only in degree   On the other hand, if there is no underlying pathology, or at most only a minimal degree, one function only need be disturbed

Disturbance in Secretory Function of the Gallbladder and Biliary Ducts —The function of mucus secretion is most pronounced in the cystic duct. Disturbance in this function results in an excessive secretion of mucus, sometimes to the extent of causing the formation of a plug of mucus in the cystic duct   This may give rise to obstruction in the duct and to hydrops of the gallbladder   John Berg[7] first called attention to this condition and referred to it as "mucorrhea cholecystica "

We, too, have seen a case of this kind, in a man In the forties who, after a negative past history, suddenly began to suffer from periodic attacks of severe pain in the upper abdomen, confined to the epigastrium and right hypochondrium except for radiation to the right shoulder and scapular region   The attacks were usually precipitated by a heavy fat meal, occurring in the late afternoon or in the middle of the night, and on several occasions morphine was required for relief   Physical examination was negative on two occasions except for the palpation of a considerably enlarged, painful gallbladder and tenderness over the right humeroclavicular joint   Operation was advised, but the patient refused   Then another attack occurred and roentgen study revealed not only poor concentration of the dye but Incomplete, slow emptying of the gallbladder after a fat meal   Eventually, the patient was operated by I Miller Kahn who found a distended, thin walled

gallbladder from which bile could be pressed out   No stones were present, but there was a large plug of mucus in the cystic duct   After removal of the gallbladder and cleaning out of the cystic duct the patient recovered and has had no further symptoms   Pathologic report of the removed gallbladder was negative except for moderate atrophy of the musculature

Disturbance in Absorptive Function —The absorptive function of the gallbladder is concerned with concentrating the bile by the absorption of its watery constituents   That the mucous membrane of the gallbladder may be disturbed in this absorptive function is well demonstrated by the fact that it may entirely or partially absorb the Graham dye at one roentgen examination, and fail to take it up at another   In some cases, repeated examinations reveal no absorption of the dye even when the dye is given by the intravenous method If the patient comes to operation, neither the surgeon nor the pathologist finds pathologic changes

It was long ago pointed out by the Mayo Clinic that if there are symptoms suggesting gallbladder disease, but at operation the organ is found to be normal, it should not be removed   If it is, recurrence is not prevented   But no explanation has been offered for such symptoms or for the caprice of the gallbladder in taking up the dye at one examination and not at another

It seems to us that the fault lies, not in the gallbladder mucosa itself, but in the nature of the bile that reaches the gallbladder   We know, to submit an analogous condition, that an individual may suffer from painful, frequent urination suggesting primary disease of the urinary bladder, whereas in reality the symptoms are due to irritation of a healthy bladder by urine that is chemically altered, being either too acid or strongly alkaline   Is it not likely that bile, which is both a secretion and an excretion, can be so altered in its chemical constituents as to be unfit for absorption in the mucous membrane of the gallbladder, thus producing a picture simulating actual disease of that organ?   If the causes of the chemical alteration persist, the bile stagnates so that bilirubin crystals

and calcium are deposited in the gallbladder to form, in time, small bilirubin calculi that serve to irritate the mucous membrane of the gallbladder and produce catarrh. When biliary colic and transient jaundice set in, surgical intervention may have to be sought, but, again, although the surgeon finds calculi of this kind, the pathologist reports only the slightest catarrhal changes in the mucous membrane of the gallbladder. After operation, the symptoms frequently return, the altered bile now causing obstruction in the common duct to the extent of producing even more persistent and severe jaundice than was caused by the bile when it affected mainly the gall bladder.

The factors altering the bile may be purely psychical just as psychical disturbances can affect the quantity and quality of gastric secretions, or the alteration may be secondary to organic disturbance in the gastro-intestinal tract other than gallbladder disease, as, for instance, peptic ulcer, especially duodenal ulcer. If alteration in bile constituency is accepted as a disturbing factor in the gallbladder's function of absorption, and that this alteration may result from psychical factors, it is easily understood why at a time when the patient is apprehensive his gallbladder fails to take up the dye, and why it does respond on another occasion when his psychic state is improved.

As a rule these cases of functional disturbance rarely develop actual pathology. If the condition is recognized and treatment directed toward improvement of the psychical state of the patient, the functional disturbance may clear up.

Disturbance in Motor Function (Dyskinesia) —Long before pathologists were able to demonstrate a definite function of the neuromuscular apparatus of the gallbladder and large biliary ducts, Krukenberg[*] in 1903, reported a case of gallbladder colic in whom neither stone nor infection was found. But it was not until 1909 that the conception of dyskinesia was developed. Aschoff and Bachmeister[*] then described a condition of gallbladder stasis (Stauung Gallenblase) and differentiated the stasis into two types. Atrophic and hy

pertrophic, the atrophy or hypertrophy being confined to the muscular layer of the gallbladder and unaccompanied by either inflammation or stone formation

Meltzer,[10] applying the law of contrary innervation to the gallbladder, concluded that contraction of the gallbladder causes relaxation of the sphincter of Oddi and by this means empties its contents, and suggested that the introduction of magnesium sulphate directly into the duodenum would relax the sphincter of Oddi, when it is contracted, and thus bring about emptying Lyon,[11] acting on this suggestion, developed the well known Lyon-Meltzer methods of diagnosis and treatment

Westphal,[12] in animal experimentation, demonstrated by means of an electric stimulus that the gallbladder normally contracts with peristaltic activity in the antral portion of the sphincter of Oddi and relaxation of the papilla vateri When he applied a stronger electric current the tone of the gallbladder was increased, the movements of the sphincter were much more marked, and the bladder emptied more rapidly A still stronger current threw the antral portion of the sphincter into spasm and caused marked contraction of the gallbladder followed by distention due to the fact that the gallbladder could not empty (*hypertonic dyskinesia*) When the splanchnic nerve was stimulated, the gallbladder and antral portion of the sphincter of Oddi relaxed but the papilla vateri contracted in spasm, resulting in atony of the gallbladder (*atonic dyskinesia*)

Lyon,[13] modifying Westphal's terminology, uses the terms "spastic" and "atonic dysfunction" Smithies[14] speaks of physiologic block, Schmieden[15] of Cholecystopathica spastica, and Newman[16] prefers spastic and atonic distention

In 1920, Schmieden,[17] after finding a kink at the junction of the neck of the gallbladder and cystic duct in a patient with gallbladder symptoms, attributed stasis to a mechanical hindrance, such as a kink, to the flow of bile from the gallbladder into the duct But the dyskinesia that we are now discussing is purely functional in nature, due to a disturbance in the vege-

tative nerves controlling the motor function of the gallblad
der, the anterior portion of the sphincter of Oddi, and the
papilla vateri

Although the findings of Westphal have not as yet been ac
cepted by all experimenters, Ivy and Sandblom[18] have done
much toward establishing the soundness of a clinical applica
tion of Westphal's findings   They have demonstrated the co
ordination between contractility of the gallbladder and spasm
of the sphincter of Oddi in the following experiment   A duo
denal tube was passed and a number of control samples ob
tained   Then a solution containing secretin and a small
amount of cholecystokinin, a substance discovered by Ivy,[19]
was injected intravenously, after which there occurred a copi
ous flow, first, of bile then of pancreatic juice. No distress
was experienced when this flow ceased, but when cholecys
tokinin was again injected a copious flow of pancreatic juice
appeared, not stained with bile, and the patient complained of
increasingly severe distress in the right hypochondrium radiat
ing to the right scapula   After fifty minutes, relief had to be
supplied by the introduction through the duodenal tube of
magnesium sulphate   Out of nineteen normal subjects studied
up to the time of this report, biliary distress was observed in
three

This experiment provides an understanding of the innerva
tion controlling the contractility of the gallbladder and relaxa
tion of the sphincter of Oddi and the manner in which it can
be disturbed to the extent of causing severe biliary colic
simulating organic disease

Just as there is a possibility for the spasticity of the
sphincter of Oddi to interfere with emptying, so may spasm
of the sphincter of Lutkens in the cystic duct   Wilkie has
demonstrated experimentally that an obstruction of the cystic
duct may lead to the deposition of calcium with the formation
of stones in the gallbladder, without infection, and more re
cently a case confirming this has been reported by Cutler and
Boggs[20] in which obstruction of the cystic duct led to the
deposition of calcium in the gallbladder   Walsh and Ivy[21] have

also obstructed the cystic duct in four dogs and have reported calculus gravel in one, postmortem

The question often arises whether dyskinesia may not eventually lead to actual organic disease, that is to stasis with eventual infection   This, of course, may happen and, according to von Bergmann, does occur frequently   But in our experience functional disorder may exist for a long time before producing organic changes, and may never bring them about as demonstrated by the fact that some of these patients, after suffering many, many years, submit to operation only to have both the surgeon and the pathologist report no abnormality

INNERVATION

Organ	Vagus	Sympathicus	
Sphincter oddi	Stimulates	→Inhibits ──→Cholecystopathica hypertonica	
Sphincter ring	Inhibits	timulates →Cholecystopathica atonica	
Gallbladder	Stimulates ←─┘ nhibits		

Gallbladder	Dyskinesia hypertonica Vagus	} Cholecystopathica	
Sphincter oddi	Sympathicus	hypertonica	

Gallbladder	Dyskinesia atonica Sympathicus	} Cholecystopathica	
Sphincter oddi	Sympathicus	atonica	

TREATMENT OF FUNCTIONAL DISTURBANCES

The treatment of disturbance in gallbladder function is not only primarily medical, but it is of paramount importance that it be directed toward improving the psychic state of the individual as much as toward the gallbladder and biliary ducts   As in all functional disorders in nervous persons, it is as important to understand the individual as to understand his disease, the success of treatment depending on this because if the patient believes in the physician the battle is won

Before treatment of the functional disorder is begun, however, every effort must be made to rule out organic disease

The most important objective examination, in addition to physical examination and cholecystography, is biliary drainage

Where there is an excessive secretion of mucus in the cystic duct with or without the formation of a plug in the duct, there is often sufficient enlargement of the gallbladder, due to hydrops, to make it accessible to palpation, especially in thin individuals When examined roentgenographically, the gall bladder is found not to take up the dye or only slightly The value of biliary drainage in these cases is that whatever bile is obtained contains no normal constituents, hence differentiating the condition from an organically diseased gallbladder due to infection

In the instance of disturbance in the function of absorption, the gallbladder takes up the dye capriciously Either only slightly, giving at most a vague shadow, or so well that it is outlined definitely If bilirubin calculi are present, the gall bladder has a mottled appearance It is in this group that biliary drainage is especially helpful Although bilirubin and calcium crystals may be present in the bile, there is a conspicuous absence of leukocytes, and bilirubin and calcium crystals alone are not an indication of inflammatory changes in the gallbladder

In dyskinesia, the gallbladder almost always fails to take up the dye, or takes it up so slightly as to cast the faintest of shadows During the time the sphincter of Oddi is contracted, bile is obtained only with the greatest difficulty, and some times not at all Again, 100 to 250 cc. of 25 per cent magnesium sulphate must be administered before bile is aspirated If there is reason to suspect atonic dyskinesia in an asthenic individual the intramuscular injection of an ampule of pituitary extract will bring about contraction of the gallbladder so that bile may be obtained When the bile is obtained, it shows no evidence of any inflammatory condition if the symptoms are due to functional disturbance

An important aid in differentiating hypertonic from atonic dyskinesia is the constitutional status of the individual

Hypertonic dyskinesia is usually found in plethoric persons

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The patient eats fast, partakes of large meals, belches a great deal, and after fatty food experiences distress over his entire upper abdomen, sometimes radiating to the midspine

Atonic dyskinesia, on the other hand, is most often encountered in the asthenic individual   This patient's appetite is poor, and, irrespective of the food taken, he always has a sense of distress and fulness in the right hypochondrium   In very thin patients the gallbladder is palpable, but not tender to touch, the enlargement remaining as a rule only twenty-four to forty-eight hours at a time

In either hypertonic or atonic dyskinesia, there may be occasional attacks of biliary colic but these are more dependent on psychical trauma than upon digestive factors   If there is spasm of the sphincter of Oddi, there may be slight jaundice or an increase in the direct bilirubin in the blood with a moderate increase in icterus index   Morphine, as a rule, does not relieve the pain but often aggravates the symptoms, causing nausea and vomiting   On the other hand, atropine 0 001 will afford relief   The application of heat is often also very successful

In hypertonic dyskinesia the introduction of 25 per cent magnesium sulphate, 50 cc , through the duodenal tube relaxes the sphincter of Oddi, overcomes its spasm, and allows the gallbladder to empty

In atonic dyskinesia, however, magnesium sulphate alone is of no value because the gallbladder musculature does not contract   For this condition, therefore, Kalk[22] advises treatment by injection of pituitrin intramuscularly, 1 ampule a day or twice a week, depending on the requirements of the case If pituitrin has no effect, tincture of belladonna 10–15 minims before each meal may be given   Should this have no effect, magnesium sulphate should be introduced through the duodenal tube with pituitrin simultaneously given by intramuscular injection

In all three types of disturbance in gallbladder function, it is important for the physician to obtain a detailed outline of the mode of life of the patient so that he may instruct the

patient when to eat, and how, these points being more important than instruction in what to eat except to eliminate fatty, greasy and fried foods As in the treatment of organic disease, it is of benefit for the patient to take a light meal before retiring in order not to be disturbed by distention of the gallbladder during the night

Some patients are benefited by the administration of three drops of dilute nitrohydrochloric acid in half a glass of water or dilute hydrochloric acid in half a glass of water, to be sipped slowly with the meal The rationale of this medication is that it stimulates the hormone cholecystokinin which brings about contraction of the gallbladder

Physiotherapy is helpful, particularly lukewarm or cool baths in the morning In some patients, diathermia applied over the gallbladder and spine brings relief

Occasionally, gallbladder and biliary duct dysfunction is the result of some other intra abdominal condition such as peptic ulcer, chronic appendicitis, or pelvic disease It may even be an accompaniment of ovarian dysfunction If this is the case, treatment must be directed first toward the original disease

In conclusion, it is to be emphasized that the treatment of disturbance in gallbladder function does not lie in removal of the gallbladder unless organic disease implants itself on the functional disorder So long as the condition is purely functional, surgical intervention but adds to the psychical trauma

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CLINIC OF DR. MICHAEL LAKE

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NONSURGICAL BILIARY DRAINAGE

THE diagnostic value of a microscopic examination of bile obtained through the duodenal tube has been amply confirmed since Lyon's[1] original contribution, even by those who do not hold with his theory as to the origins of the various fractions Thus Jones,[2] in 1924, in a series of forty two surgically proven patients with gallstones, found an excessive precipitate of cholesterin, calcium or bilirubin crystals in forty-one   The other case showed rare clumps of bilirubin and a very large amount of bile stained columnar epithelium   He concludes, after studying a large series of controls, that "abnormal crystalline elements are nearly always to be found in the presence of biliary calculi "   In a recent contribution from the Surgical Service of the Presbyterian Hospital, Whipple[3] states   "The findings of cholesterol crystals, calcium bilirubin particles and pus cells with bacteria in the duodenal contents obtained by duodenal intubation is, in our experience, even more reliable than cholecystography in demonstrating true pathology, that is, a lesion requiring surgical therapy   In many patients a failure of the gallbladder to take the dye or empty it, indicates disturbed physiology of the gallbladder "   Yet it is a diagnostic aid which is too often neglected, on the grounds that it is a very uncomfortable and difficult procedure, and, since the Graham test is almost infallible it is not necessary   I do not agree with either of these premises   Biliary drainage, with the proper technic and a little experience, is less uncomfortable to the patient than a gastric extraction with the large tube for a test meal   although it takes longer to do   It does however

take considerable training and experience to get the most in formation out of this procedure

The highly optimistic figures for the accuracy of the Graham test, ranging from 94 to 100 per cent are based on published series of carefully studied cases that came to operation, where the preponderance of evidence favors a diseased gallbladder, and gives us no idea of the number of "normal" cases that would show pathology   Frequently, in our series in 29 per cent of the cases, the x-ray evidence alone was inconclusive   In this group fall abnormally faint shadows, unusual shapes, questionable mottling, and delayed emptying   Errors occur also in the "no shadow" cases, due to failure of the gallbladder to empty and admit the dye, to irregularity in absorption of the dye or possibly to some disturbance of the sphincter of Oddi which may cause premature emptying, before the dye has been sufficiently concentrated to cast a shadow   In Hitzrot's[12] series, 10 of 74 gallbladders reported by x-ray as "poorly functioning" were found normal at operation   In eight of these he attributes the disturbed function to lesions in organs closely associated with the biliary tract (duodenal ulcer, appendicitis, liver disease, etc)   Whatever the explanation, normal gallbladders have been found when no shadows could be obtained, even by the intravenous method   The largest number of errors, however, occur in cases that show an apparently normal shadow   Calculi may be obscured by the density of the surrounding dye, as in this case

Case I.—A woman of forty-nine with a history of gallbladder disease showed a dense, smooth, apparently normal shadow   Following a high fat meal, the shadow became less dense and definite stone shadows became visible

An abnormally faint dye shadow may obscure stone shadows, due to lack of contrast.

Case II.—A woman of twenty-seven with a history of biliary colic following pregnancy showed a faint shadow which did not change in size after the meal   The first two biliary drainages produced no dark bile, the yellow bile containing much bile-stained mucus, epithelial cells and lipoid material, but no crystals   On the third drainage 2 ounces of black tarry bile were recovered, containing many cholesterin crystals   A second Graham test then

gave a fairly dense shadow which was definitely mottled and which con
tracted moderately well after the meal Incidentally, following the recovery
of the dark bile she had two severe colics within a few days.

I have pointed out some of the errors which may arise in
interpreting the Graham test What help may we get from the
Lyon test, and what errors may we fall into?

1 As a Test of Gallbladder Function.—The recovery
of a good "B" fraction (1 to 2 ounces of a dark brown, dark
green or black bile) after stimulation by magnesium sulphate
or olive oil, usually means that the gallbladder is discharging
its contents Thus it has been shown[4][5] that if a drainage is
performed fourteen hours after the Graham dye is ingested, re
covery of a good "B" fraction is accompanied by a moderate
or marked decrease in the size of the gallbladder shadow, and,
further, that most of the dye (as indicated by the iodine con
tent of the bile) is present in this dark fraction Sweet's
theory[6] that the decrease in the size of the cholecystogram is
accomplished by absorption of the dye by the gallbladder wall,
and that the increased concentration of iodine in the duodenal
contents is due to a reexcretion of this absorbed dye in the
hepatic bile, has been definitely disproved by Voegtlin, Green
gard and Ivy[7] in experiments on dogs They demonstrated
that the concentration of iodine does not increase in the hepatic
bile stream, but does very definitely increase in the common
duct during evacuation of the dye filled gallbladder, induced
either by the stimulus of cholecystokinin or a fat meal Usu
ally therefore, a good "B" fraction means good concentrating
ability of the gallbladder wall, patent ducts, and the ability to
at least partially empty its contents However, this is not al
ways true With a nonfunctioning gallbladder, as after chole
cystectomy, we may occasionally get a fairly dark bile from
the dilated biliary ducts Also the failure to obtain a "B" frac
tion on one or two occasions cannot be considered too seri
ously, especially in a nervous patient The same factors which
may interfere with getting a good shadow by x ray may pre
vent a concentration of the bile In every case where a definite
gallbladder shadow is secured by x ray, we should, with proper

technic and by repeated attempts if necessary, get a good "B" fraction   Conversely, when a good "B" fraction is obtained, the presumption is that the gallbladder should be visualized by x-ray, and repeated attempts should be made before we conclude that no shadow can be obtained

Thus, in 29 drainages in which a good "B" fraction was recovered, we were able to visualize the gallbladder in 28, sometimes after several attempts   In one case there was no shadow on two attempts

2 Significance of Microscopic Elements in Bile— *Parasites*—The most frequent parasite found in the duodenum is Lamblia (Giardia) intestinalis   It may invade the biliary ducts and even the gallbladder[8] and cause symptoms simulating gallbladder disease   It is not a rare condition   These parasites are readily detected if a fresh drop of bile is examined, as they are very motile   MacPhee and Walker[9] state that giardiasis should be considered in all cases where cholecystectomy is contemplated, in the absence of definite evidence of gallstone, and recommend a microscopic examination of duodenal contents in all such cases, as a cholecystectomy will not relieve their symptoms if Giardia are present   There is very little doubt that if present in sufficient numbers, these organisms are pathogenic

Case III.—A forty-three-year-old German housewife complained of a "bloated" feeling in the upper abdomen and at times a gnawing sensation in the right upper quadrant one hour after meals for about two years   The pain did not radiate, and was worse after butter, eggs, fried foods and raw onions   There was no vomiting or jaundice, the bowels had a slight tendency to looseness, moving twice a day, but no definite diarrhea   Her past history was negative except for appendectomy in 1908   She had never been in the tropics   The examination was essentially negative except for slight tenderness in the right upper abdomen, and a hernia in the appendectomy scar   She was somewhat obese   Graham test was negative   Wassermann was negative   Biliary drainage   Bile cloudy, containing numerous suspended mucous flakes   Spurts of dark bile were recovered

Microscopic examination   Whole field filled with motile Giardia   Stools Giardia cysts found   She was given 4 injections of arsphenamine at weekly intervals   Examination of bile two, three, four, and five months later was negative   No ova were found in the stools   The gnawing pain and belching had disappeared and the stools were more solid

The original clinical diagnosis was cholecystitis The Graham test did not confirm it, but neither did it eliminate it Examination of the bile established the presence of Giardia and this was confirmed by stool examination The therapeutic response suggests that the Giardia caused her symptoms

Smithies[6] observed Necator americanus in the bile in one instance and Endamoeba histolytica in several cases Jones[2] recovered Schistosomum hematobium eggs through the duodenal tube in one case

Other Abnormal Elements in Bile.—(a) *Cholesterin Crystals*.—These are flat, transparent, colorless plates with sharp, straight edges, often with a nick in the corner They resemble cover slips with broken corners When present in clusters, the diagnosis of gallstones is almost certain, in my experience

(b) *Calcium Bilirubin Masses*.—These may be present as brilliant yellow or orange amorphous masses, or as a bunch of large round crystals They are said to have the same significance as cholesterin crystals

(c) *Columnar Bile stained Epithelial Cells*.—These, especially when present as "rosettes," are thought by Lyon to come from the gallbladder

(d) *Bile stained pus cells and bile stained mucus*

(e) *Lipoid or Oleaginous Material*.—This may be present as yellow globules, but tends on standing to coalesce into lakes and pools Lyon has found it to be a fatty ester of cholesterol and believes it to be most suggestive of cystic duct catarrh or of cholesterosis of the gallbladder

If much saliva is swallowed, the duodenal contents may contain many squamous cells, salivary corpuscles, and pus cells from the mouth With proper technic, this can be largely avoided

In 52 consecutive patients who were referred for diagnostic drainage, because of suspicion of gallbladder disease, we had the following correlation with the Graham test

1 Of eight patients with definite stone shadows, seven

had good "B" fractions and one a doubtful "B" bile   Microscopic examination was positive in seven, and doubtful in one   Three showed cholesterin crystals in clusters, and only one failed to show any crystals, but contained bile-stained epithelial and pus cells and lipoid material

2   Of six cases with no shadow by x-ray, there was a doubtful "B" fraction (slight darkening of the bile) in two, and no "B" fraction in three   In one case a good "B" fraction was obtained   Microscopically, there was evidence of disease in three cases, an occasional abnormal element in one, and negative in two   In the absence of a "B" fraction, we cannot attach too much importance to a negative microscopic examination   Thus, of six cases diagnosed as pathological by x-ray, our drainage findings confirm the diagnosis in three, contradict it in one and give no assistance in two   Five additional cases that showed no shadow on the first Graham test subsequently had a shadow   Three of these had good "B" fractions and two ' doubtful "B" fractions

3   Twenty suspected cases had normal Graham tests   Sixteen of these had good "B" fractions, two a doubtful "B" fraction   No dark bile was obtained (on a single attempt) in two cases   None of the pathological elements were found in eleven cases, a very occasional crystal or cell in six, and the bile was considered definitely pathological in three patients   In one otherwise normal case Giardia were found   In one additional case the shadow was first considered normal but the bile pathological, and a later Graham test was reported as "mottled "   Thus, the drainage findings supported the x-ray diagnosis in eleven, contradicted it in three and did not help in six cases   The presence of an occasional cell or crystal is probably of no significance, although one of our stone cases showed only that

4   We studied eighteen cases in which the Graham test was suspicious, but not diagnostic   A good "B" fraction was secured in five, a doubtful fraction in nine, and none in four cases   The bile was considered pathological in nine, normal in five (one of which, however, had no "B" bile) and uncertain

in four cases   Thus, our findings confirmed the suspicion of pathology in half of this group

Bacteriological Study of Bile—Value of Cultures — Even with the most careful technic, the chances of contamination are so great that we must be very conservative in attributing significance to organisms recovered from drained bile However, if the same organism is repeatedly obtained from "B" bile which cannot be grown from the mouth or stomach and is present in greater numbers in bile than in duodenal contents, its presence must be considered significant of biliary infection   Cultures are most useful in detecting typhoid carriers   Infection may of course be present in the gallbladder wall and the bile may be sterile.

Pancreatic Ferments —When these are entirely absent in the duodenal contents we may assume an obstruction of the pancreatic duct. If bile is also absent, the obstruction must be in the common duct distal to the junction of the pancreatic duct. Slight variation in the amount of ferments present is of no great significance

Chemical Analysis of Bile —Twiss, Killian,[10] and their coworkers are conducting an elaborate study at the Post Graduate Hospital on the significance of the quantity of cholesterol, cholesterol esters, bile acids and other substances in various bile fractions obtained through the duodenal tube, and are guided in the diets they prescribe by these findings, especially by the cholesterol content, as well as the level of the blood cholesterol

Case IV —A woman of thirty with complaints suggesting either a peptic ulcer or cholecystitis had an x ray examination of the gastro-intestinal tract which was negative except for adhesions about the hepatic flexure   The first Graham test showed no gallbladder shadow   On drainage 40 cc of brown bile was recovered containing many cholesterin crystals in clusters   A second Graham test revealed a definite gallbladder shadow containing a laminated stone

Case V —A thirty six year-old salesman complained of heart burn one hour after meals for five years with freedom for not longer than one week accompanied by belching and regurgitation of sour material   On one occasion he was awakened with a severe pain in the upper abdomen and back. From

ination was essentially negative except for moderate tenderness in the right
upper quadrant and epigastrium   Radiographic examination of the gastro-
intestinal tract showed an overactive hypertonic stomach   The duodenal
cap was irritable and spastic   It could be filled out under the fluoroscope,
but appeared defective on the films   The colon was spastic   The appendix
was beaded and its tip fixed, but not tender   Films of the gallbladder region
showed no shadow on several attempts   On one of the films there was a
questionable, faint, ringlike shadow

Biliary Drainage—No dark bile was obtained, but the yellow bile was
somewhat darker and more viscid than normal   It contained clusters of
cholesterin crystals, calcium bilirubin masses, lipoid material and bile-stained
mucus   A diagnosis of gallbladder disease with stones was made and an opera-
tion advised

He entered another hospital and was again studied   On the basis of x-ray
studies, a diagnosis of duodenal ulcer was made   No gallbladder shadow was
obtained but this was not considered significant "in view of the pathology
in the cap"   On operation, the cap was found normal but a thickened gall-
bladder containing seven stones was removed, as well as a sclerotic appendix

The staff at the hospital where he was operated made the
error of disregarding the drainage findings, which, together
with the absence of a gallbladder shadow, should have been
sufficient to make a correct diagnosis   Clinically, symptoms
for five years without remission for longer than a week is a
most unusual course for a duodenal ulcer, if it occurs at all
The most characteristic point in an ulcer history is the perio-
dicity of its course, with long intervals of freedom from pain

Summary of Diagnostic Points—1   The only finding
by x-ray which is not subject to error is a definite stone
shadow   The largest number of errors are in the "normal"
group

2   The ability of the gallbladder to be visualized by x-ray
after the Graham dye is usually accompanied by finding "B"
bile on drainage   If these findings do not agree, the tests
should be repeated

3   Where the x-ray findings are suspicious, such as sub-
standard shadow, unusual shape, or questionable mottling,
we should seek confirmatory evidence of disease by the micro-
scopic examination of the bile   A negative result of course
does not rule out gallbladder disease, but is a point against it
The presence of a large number of cholesterin crystals and

calcium bilirubin masses is, in our experience, almost diagnostic of gallstones

4 The possibility of giardiasis as the cause of symptoms which simulate gallbladder disease should be kept in mind and the bile should be examined in all such cases before operation

5 Bacteriological studies are sometimes of value, but are often disappointing

Therapeutic Value of Biliary Drainage —1 *In Catarrhal Jaundice* —There is fairly general agreement among most men who have tried it, that frequent flushing of the duodenum with hot water, magnesium sulphate and other substances shortens the obstructive stage of this disease and usually results in a quick recovery of the patient. In the early stages no bile is obtained, the duodenal fluid contains unstained epithelial cells and pus cells When bile begins to flow, it contains bile stained plugs of mucus, sometimes tabular casts made up of epithelial debris, bile pigment and pus This normally soon disappears

Occasionally, when the obstructive phase is prolonged there is so much liver damage that the jaundice continues These cases may go on to acute yellow atrophy and die, or the liver and spleen may become enlarged and follow the course of the hypertrophic cirrhosis of the liver The prognosis, as a rule, is bad We had occasion recently to see such a case where the symptoms gradually cleared up after two years

Case VI —A twenty seven year-old Porto Rican was admitted on January 8 1933 complaining of increasing yellowness of the skin and generalized itching for twenty six days His stools had been clay colored There was no abdominal pain at any time but on January 11th he had an attack of belching and a sense of fulness in the epigastrium He was nauseated on two occasions and vomited once

Past History —Lived in Porto Rico until the age of fifteen then came to New York He has been back several times the last time in September 193 He had malaria when eight years old acute gonorrhea in 1911 and a running ear at the age of fourteen Appendectomy in 19 There was no history of diarrhea

Examination revealed a well-developed rather thin deeply jaundiced young man His skin had an orange yellow color and had numerous scratch mark He did not look acutely ill Temperature and pulse were normal The sclerae were yellow the tonsils moderately enlarged and a few enlarged

nodes in the neck Heart and lungs negative The upper abdomen was tender on deep pressure, the liver edge was 7 cm below the costal margin, and appeared to be enlarged to the left as well as downward The surface and edge appeared smooth The spleen was also enlarged

Laboratory Tests—Stools on 5 occasions were negative for bile, parasites and ova The urine contained much bile Urea nitrogen 14, icteric index 500 Red blood corpuscles 4,800,000, hemoglobin 100 per cent, white blood corpuscles 6950 with a normal differential count, except on one occasion an eosinophilia of 10 per cent was reported This was not found on several subsequent examinations Wassermann negative

Duodenal drainage was attempted on January 31st and again on February 4th but no bile could be obtained He was placed on a high calorie high carbohydrate diet The jaundice continued and several consultants agreed that in view of the duration of the obstructive jaundice and the possibility of a "silent" stone or tumor, he should be explored

On February 18th an exploratory operation was performed by Dr Heuer The liver was brown, firm, greatly enlarged, symmetrically, and deep scars were present on its surface The gallbladder was collapsed The common duct was not dilated and apparently not inflamed The spleen was enlarged, smooth and freely movable No stones were felt The abdomen was closed Postoperative diagnosis "Obstructive jaundice due to cirrhosis, probably Hanot's cirrhosis "

Subsequent Course—He recovered quickly from the effects of the operation The jaundice gradually decreased, and on March 21, 1933, the stools were normal in color, the liver, however, was still large, the icteric index was 50, and the itching very troublesome On March 23rd, bile obtained by duodenal tube contained "numerous small needle-shaped crystals " On March 30th he was discharged to the out-patient department, on a high carbohydrate diet

A series of biliary drainages were given at weekly intervals, at first in the clinic, and later he was taught to drain himself at home About 300 cc. of bile was recovered in a three-hour drainage It contained mucus, round epithelium, an occasional cholesterin and calcium bilirubin crystal, and some lipoid material Subjectively, the pruritus improved after each drainage for about a week The urine was negative for bile on June 2, 1933 The icteric index very gradually decreased and finally reached 7 2 in November, 1934 At that time his liver was only slightly enlarged, the spleen could not be felt, and he was free of complaints He does a drainage himself at home at least once a month The van den Bergh test is still slightly positive with direct and indirect reaction

Comment—This case is unusual in that the residual hepatitis lasted for almost two years, and apparently is getting well The history of being in the tropics and the 10 per cent eosinophilia made us look repeatedly for parasites, but we found none The needle-shaped crystals may have been tyro-

sin, which is found with severe liver damage   He was subjectively much better after a drainage, and objectively improved

2 *Gallbladder Disease*—Advanced gallbladder disease is primarily a surgical condition, and no form of medical treatment can cure a thickened, inflamed, often adherent gall bladder wall   However, there are contraindications to cholecystectomy, and often patients are unwilling to undergo an operation   My experience in treating these cases by drainage has been very limited   However, beginning with a very skeptical attitude, I have made the following observations

(*a*) The immediate relief from symptoms is frequently dramatic   This occurs often in cases with advanced pathology, and it is unlikely that the psychic element plays much part in the improvement.   Objectively the sallow color of the skin disappears and the patient looks in generally better health   In other cases no particular effect is noted, either subjectively or objectively   And occasionally a colic may be induced by drainage.   Whether the apparently beneficial effect is permanent is doubtful, but some patients with stones can certainly be kept symptom free for years by draining them, when the pain begins to return   Neurotics feel better for two or three weeks, but their complaints soon return

(*b*) I am impressed by the number of cases with mild symptoms that show no x ray shadow and no "B" bile at first, the bile containing much brown mucus and lipoid material After a few drainages a dark bile is recovered, after which a second Graham test shows a good shadow   This corresponds to Lyon's description of "cystic duct catarrh"

3 *In Cholangitis and Hepatitis*—In cases with residual infection in the intra and extrahepatic ducts following cholecystectomy, withdrawing large quantities of bile by the tube is sometimes a very gratifying procedure   The bile contains much bile stained pus, bacteria mucus and often tubular casts It tends to clear up the chills, fever and jaundice   It will not of course, cure an obstruction due to stone or constriction of the common duct

4 *Other Conditions*—Persistent generalized urticaria in
one case after three years without freedom for more than a few
hours, cleared up after three biliary drainages   The fre-
quency and severity of migraine attacks are often decreased
by withdrawing bile from the duodenum   What the explana-
tion is I do not know, but it apparently increases the detoxify-
ing function of the liver in some way, just as venesection may
benefit a decompensated heart   The liver has great regenera-
tive powers and may permanently regain its function after a
period of decreased activity

In conclusion, I do not wish to leave the impression that
the conditions I have mentioned are always benefited by drain-
age, or that other measures should be neglected, but frequently
enough the results are so gratifying, that this therapeutic meas-
ure should not be neglected

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CLINIC OF DR. PARKS McCOMBS

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THE MANAGEMENT OF TWO CASES OF DISEASE OF THE BILIARY TRACT FOLLOWING CHOLECYSTECTOMY FOR STONES

WE are presenting the two following cases of disease of the biliary tract in each of which there was a definite history of gastro-intestinal symptoms for some years previous to the cholecystectomy for stones In both cases there was complete relief for only a short period followed by recurrent attacks of malaise, nausea, vomiting, elevated temperature, and abdominal pain which required bed rest The intervals between the attacks were associated with malaise and general abdominal discomfort There was no benefit from a regime of diet, rest, proper elimination and autogenous vaccine Transduodenal lavages were added to this established regime with the result that the attacks have decreased in frequency and severity, and the patients have been relieved of their symptoms so that they now lead their normal lives

These two cases illustrate the problem involved in the treatment of chronic cholangitis that often complicates chronic cholelithiasis and is the cause of recurrent attacks of fever, abdominal discomfort, etc. that follow cholecystectomy By Lyon's transduodenal lavage we have succeeded in relieving patients of symptoms who have had no benefit from any other type of treatment If Lyon's drainage is to be successful, it must be done correctly and over a prolonged period of time.

Case L—"Y" is an overweight Hebrew woman of fifty-seven who has always eaten a diet rich in content and variety She has lived an active life

and had many responsibilities and worries   She has consumed very little alcohol and smoked 10 to 20 cigarettes a day

Between the ages of fifteen and thirty-five, she had recurrent attacks of general abdominal discomfort, which varied in intensity from mild to severe, and which were inconstantly associated with an elevation of temperature (99° to 101° F)   Beginning about this same time she had attacks of pain in her right shoulder which were diagnosed as "neuritis"   These were sometimes associated with a rise in temperature, but not with any abdominal pain, nor with indigestion   Occasionally the pain was severe enough to require codeine for relief   The first attack of jaundice occurred at the age of twenty-two, during the third month of her first pregnancy   It was ushered in by sensations of chilliness and fever followed by nausea and vomiting, but there was no abdominal pain   The jaundice gradually disappeared after two to three weeks   Even after this, the recurrent attacks of abdominal discomfort and pain in the right shoulder were not associated with disease of the gallbladder and no diagnosis was made   She had no fatty or other food dyscrasia, or "indigestion" as such

At the age of forty-nine the attacks of pain in the right shoulder were occurring about once a week   They were now associated with fever (100° to 102° F), belching of gas, and some tenderness on pressure over the right upper quadrant   There was no abdominal pain   These attacks were thought to originate in the gallbladder, but the diagnosis was not proved as she refused to be x-rayed or otherwise investigated   During about the sixth of these attacks she became jaundiced, and for the first time she had definite pain in the right upper quadrant which radiated to the right shoulder   There was nausea and vomiting, with a temperature ranging from 102° to 103° F   After two to three weeks the attack subsided   Cholecystography revealed the shadow of three large faceted stones   After two months of frequent typical febrile attacks a cholecystectomy was performed   Beside the stones there was a putty-like material in the gallbladder   The pathologist reported that the gallbladder showed an acute hemorrhagic cholecystitis

At no time since the operation has there been a recurrence of the pain in the right shoulder, which for thirty years was diagnosed as "neuritis"   During the first six months following the removal of the gallbladder and stones she was free from any symptoms, but from that time she has suffered from periodic attacks of gastro-intestinal discomfort   At first they occurred every twelve to twenty-one days and would last from one to fourteen days   A typical attack would be preceded by a feeling of malaise, and abdominal discomfort which developed into midepigastric pain, nausea and vomiting, without jaundice, and a temperature ranging from 100° to 103° F   There was a definite rise of leukocytes (11,000 to 12,000) and icteric index of 9 plus, cholesterol   240 mg

During the following two years she was seen by a number of able diagnosticians, and the consensus of opinion was that the recurrent attacks were due to a persistent cholangitis and an associated duodenitis and colitis   She was very conscientious in following out the régimes prescribed for her

The treatment consisted of   (1) Rest and freedom from family responsibilities and activities, (2) a diet low in roughage, fat and spicy food, (3) an

autogenous vaccine made from the Streptococcus hemolyticus and viridans and Bacillus coli obtained from stool cultures, and (4) careful attention to her elimination

She did well for only a few months and then the old gastro intestinal attacks recurred more and more frequently until she was confined to bed two to three days out of each week

A gastro intestinal series and Graham test were repeated and revealed only a spastic colon The cholesterol of the blood and icteric index were normal The stool examination showed nonhemolytic streptococci and Bacillus coli

In an attempt to establish the diagnosis and later as a therapeutic procedure she was given transduodenal drainages according to the technic of Dr Lyon During the first drainage the flow of bile was slow and it was necessary to use frequent stimulations with hot water and Epsom salts The bile obtained was small in amount and very thick in consistency The microscopic examination showed that it contained many clumps of pus cells many bacteria and cholesterol esters The cultures of the bile showed Streptococcus hemolyticus and Bacillus coli. We therefore concluded that as this woman had a chronic infectious cholangitis, we would try the therapeutic effect of the Lyon s drainages.

She was hospitalized for two weeks. The tube was left in the duodenum for the first twenty four hours with natural drainage during sleep and with frequent stimulations of hot water or olive oil during the waking hours She was drained for eight of the second twenty four hours, then four hours each of the next five days The intervals were then increased to every other day for a week then once weekly for three months Finally the schedule was determined according to her condition which averaged about once in three to four weeks for the first year Subsequently the intervals were greatly increased

In addition to the drainages the patient was given a carefully regulated diet in which the protein was limited to a small serving of animal protein five times a week All condiments coarse and rich foods were interdicted and small feedings of fruit juices fortified with maltose were ordered between meals

A definite schedule of rest and exercise was prescribed The only medications which she took were decholin tincture of Belladonna and an autogenous vaccine made from the organisms in the bile

The bile from each drainage has been studied bacteriologically and microscopically as well as macroscopically During the first drainages frequent stimulation was necessary to secure a free flow of bile The bile was thick very dark in color and contained large amounts of mucus pus and cholesterol esters. The bacteriology we have described above After the first month the character of the bile had entirely changed in that it was no longer viscid the drainage was free and spontaneous. The content of pus, mucus plugs cholesterol esters and bacterial flora diminished progressively until the picture presented was normal at the end of three months

Clinically the patient improved concomitantly with the changes in the bile The gastro-intestinal attacks recurred with longer and longer intervals—their duration was shorter and they were less severe During the third month

of treatment she was entirely free from them   During the fourth and fifth months, as she was out of the city she had no drainages, but continued the rest of the régime   In this interval she had just one attack

From this time her progress has been interrupted by periodic recurrences that could always be related to dietary indiscretions, overindulgence in ex hausting activities, and increased mental strain   We have always found a definite correlation between the physical state and the type of bile recovered When a drainage was given at the first signs of an impending attack, the flow of bile was more spontaneous and less dependent on stimulation, and the char acter of the bile was more normal   If an attack progressed until she had a temperature and chilliness the bile would become viscid, very dark and contain pus cells and bacteria

Until the winter of 1933 we were prone to emphasize the importance of the relationship of her mental and nervous state to the gastro-intestinal symptoms   But in spite of increasing mental strain and stress due to family and financial crises that have necessitated a complete change in her mode of living, her physical well-being has been progressively better   The explanation seems to lie in the fact that she has lived more simply with fewer indiscretions of her diet, and fewer social activities   She has had no febrile attacks for eleven months and during the past two years has required only four or five duodenal drainages at irregular intervals   The bile from these has been normal in every respect including negative cultures   The only medications she takes at the present time are directed toward keeping the bowels open and a sedative to reduce nervous tension

Summary —From the age of fifteen, this woman had had recurrent attacks of abdominal discomfort, "neuritis" of the right shoulder, and one attack of jaundice at twenty-two Stones were found in the gallbladder after a second attack of jaundice at the age of forty-nine   Following cholecystectomy there was a period of only six months before there were recurrences of gastro-intestinal symptoms which were not relieved by the usual methods of vaccine, rest, diet and proper elimination   After duodenal drainages were added to the régime, the attacks became less severe, less frequent and the bile cultures were negative   In spite of increased nervous tension, she has improved and at the present time has been eleven months without a febrile attack, and can go for three to six months without duodenal drainages

Case II —"B "   This is a housewife aged thirty, who lives simply and has never indulged in an excess of foods, alcohol, or tobacco   She does not do the manual work but has the responsibility of running the house for her husband and three growing children

She has never been a robust person, but was always able to carry on the duties without undue fatigue. In 1927, at the age of twenty four she had the first attack of gallbladder pain which she described as a "terrific stomach ache under the right ribs" associated with nausea and vomiting but no jaundice. The stools and urine were not noted. The pain lasted only one hour and she felt perfectly well after it subsided. This episode occurred in the fourth month of the second pregnancy followed by three similar ones during the remainder of the pregnancy and a much more severe one just after delivery. In each the onset of pain was sudden located in the right upper quadrant, and radiated to the right shoulder. It was of such intensity that morphine was required to give her relief. At this time an x ray was made of her gall bladder which revealed the presence of stones.

For the next five years she was free from any attacks of pain. She had no intolerance for fatty foods. During her third pregnancy (1931), she had considerable gas, and heartburn but no sharp attacks of pain. In the fall of 1932 she had an attack similar to the one after her second pregnancy. The first one came on after a meal of highly seasoned Mexican food and was followed by frequent recurrences until April 1933 when a cholecystectomy was performed. Stones and a putty like material were found in the gallbladder.

For three days following the operation she had such severe pain in the right upper quadrant with radiation to the shoulders, that a second operation was considered. It was not done, as the symptoms abated and for a period of five weeks she was free of any pain. During the next nine months she had repeated attacks of such severe pain that morphine was required for relief. Each attack was ushered in by constipation then diarrhea and a great deal of gas and heartburn then the pain in the right upper quadrant and nausea and vomiting. There was no jaundice of the skin and the color of the urine and stool was unchanged. Her temperature ranged from 100 to 101 F for twenty four to forty eight hours, and she felt so miserable that she was unable to be up and around for several days. In between attacks she did not feel really well and she was not free of abdominal discomfort. This became worse one half to one hour after meals, though she did not associate it with any one type of food. Soda mints would sometimes relieve the gas. Her diet was uncontrolled except that he was told to avoid "fatty foods" in general. Throughout the summer of 1933 she ran a low grade afternoon temperature (99 to 100 F) and felt that she could not muster enough energy to do any thing at all.

She was carefully examined and her chest x rayed to rule out any evidence of active tuberculosis of her lungs. There were old scars at the apices which remained unchanged.

On physical examination the only abnormal finding was that she was underweight. We have never seen her during an attack but it is reported to us that there is no tenderness at the time.

We first saw her in January 1934 nine months after her operation. She was practically an invalid because of the frequent attacks and with no real freedom from the discomfort in the short intervals. We felt that this was another case of infection in the biliary tract and that it would be worth while to put her on a régime similar to that of patient "A" We outlined a course

of treatment which was to include rest, relief from responsibilities, diet, care
ful attention to elimination, and stimulation of the flow of bile by drainage
and cholagogues

Five duodenal drainages were done at daily intervals, then three times
a week and gradually lengthening the intervals as the attacks became less
severe and less frequent   She was advised that her régime was elastic and
that she should report for a drainage as soon as she had any warning of the
constipation, malaise, nausea or vomiting, etc   She has now gone over two
months without feeling the need for a drainage

At first the bile was thick, it contained many single and clumped white
cells, mucus plugs and cholesterol crystals   We found the bile flowed most
easily and continuously after stimulating with olive oil   We had repeated
cultures of the bile which showed the same organisms each time   A vaccine
was made containing the Streptococcus hemolyticus and Bacillus coli   It was
begun with 0 1 cc and increased by 0 1 cc at weekly intervals until 1 cc was
reached   If a reaction occurred, the same dose was repeated   The maximum
dose was maintained for one year, the interval between doses was increased
gradually to three to four weeks   The bile cultures have remained negative and
we have now discontinued the vaccine for the present   As the bile cultures
became negative, the bile showed fewer pathological findings, there were a few
scattered white cells and an occasional plug in the last drainage, which is not
above normal

Her diet has been restricted only in highly spiced food and protein   Her
blood cholesterol was normal and as she had no fat intolerance we did not
feel it necessary to reduce her intake below that of a normal home diet   The
olive oil stimulated a more continuous flow of bile, so we added one teaspoon
ful of it fifteen minutes before lunch and dinner   Dilute hydrochloric acid
was given with meals as the acid content of the stomach had been consistently
low to absent   A cholagogue, such as decholin, seemed to help stimulate the
bile and regulate the bowels   A sedative was used as needed for control of
nervousness   Her social and family responsibilities were curtailed at first,
so that she had more time for definite rest periods each day   She was urged
to do as much out-of-door exercise as she was able without fatigue

These restrictions have been lessened until now she is able to lead an
essentially normal life   She reported in March, 1935, for her last drainage
The cultures were negative, and the appearance of the bile was essentially
normal   She reported that her feeling of well-being was greater than at any
time since 1927   She is now able to undertake her home responsibilities and
whatever outside obligations she wishes without undue fatigue   Her last
positive bile culture and her last attack of abdominal discomfort or indigestion
was in September, 1934

We do not feel she is cured, but that with care of her diet and avoiding
excess fatigue that she is now able to take up her responsibilities and a normal
mode of living

Summary —This second case, of a woman of thirty, had
her first attack of jaundice in 1927, during pregnancy   She

had severe abdominal pain associated with nausea and
vomiting which was recognized as of gallbladder origin from
the start   After cholecystectomy she had only five weeks of
freedom before the recurrence of attacks of abdominal pain,
nausea, vomiting and fever   These came at increasingly fre-
quent intervals until the institution of a régime of rest, regu-
lated diet, duodenal drainage and vaccine   She has now been
able to go seven months without drainage and without the
recurrence of the toxic symptoms

CLINIC OF DR. HOWARD PATTERSON

Roosevelt Hospital

RELIEF OF CHRONIC ARTHRITIS BY CHOLECYSTOSTOMY RECURRENCE APPARENT CURE FOLLOWING CHOLECYSTECTOMY

ONE frequently reads that the gallbladder may "occasion ally" be the sole causative focus of infection in certain types of arthritis However, when one searches for actual convincing case reports to support such statements, it is very difficult to find them

The patient whom I wish to show you presents several features in his clinical history which in our experience are very unusual and interesting He is a fifty year-old patrolman who first came to the Roosevelt Hospital four years ago complaining of severe joint pains. His increasingly disabling arthritis involved chiefly the spine and the small joints of the hands, but the shoulders and hips were at times painful For a year and a half he had tried a variety of therapeutic measures without relief He seemed to be very sensitive to even small doses of salicylates Strict dietary restriction resulted in no improvement in his symptoms, and nearly all of his teeth were removed without benefit He had also received a series of "injections" probably some form of nonspecific foreign protein Other features of his recent past history included a rather marked loss of weight and a somewhat questionable story of periods of slight jaundice

Eleven years before his admission to this hospital, he had been confined to bed for a period of eight months with swollen painful joints Subsequently on account of upper abdominal symptoms a right upper quadrant exploration was done The appendix was removed and a "diseased gallbladder" was found The patient was under the impression that the gallbladder containing stones, had been removed at that time The records of the hospital where the operation was done are inadequate and I have been unable to get an accurate report of just what was found

Following the operation his arthritis rapidly cleared up much to the surprise and delight of the patient This relief of his joint symptoms had lasted some eight years when the recurrence began which eventually brought him to this hospital to seek relief

x-Ray studies, on admission, showed advanced arthritic changes in the entire spine   Several of the joints of the hands were also markedly involved. A search was instituted for possible foci of infection   His few remaining teeth showed no apical infection, and the sinuses were all clear   The tonsils were considered innocuous by our consultant, Dr Hampton Howell   The micro scopic blood findings were negative, as were also the blood chemistry figures. The blood Wassermann test, gonococcus fixation test, and prostatic smear

Fig 84—Section of gallbladder wall, showing ample microscopic evi dence of chronic and subacute infection   (Ulceration of mucosa, cellular in filtration, edema and fibrosis of muscularis and serosa)

were likewise negative   The blood sedimentation rate figures were high (115 mm /hr., later falling to 77 mm /hr)

In view of the interesting history of relief of his arthritis after an opera tion on the gallbladder many years before, it seemed possible that this viscus was once again the source of trouble, in spite of the fact that the patient in sisted that it had been removed at that time   Accordingly, a Graham test was done, and x-ray studies revealed a small faintly visualized gallbladder, with the shadow remaining about the same following a fatty meal   A second dye test was done several days later, with similar result, and the patient was

transferred to the surgical service for operation After rather tedious dis-
section through dense adhesions, I found a small thickened gallbladder My
impression was that the operation of ten years before must have been a chole
cystostomy The gallbladder was removed and was delivered to the laboratory
under aseptic conditions. A pure culture of a nonhemolyzing streptococcus
was obtained from the gallbladder wall and an autogenous vaccine prepared.
The patient made a smooth postoperative recovery and went home on the
sixteenth day Small dosage of the vaccine induced a striking "flare-up" of the
arthritic joints. Symptomatic improvement was prompt, and he has now
been followed nearly four years during which time he has been working
regularly and has had no return whatever of his arthritis. He has been seen
in the out patient department regularly on account of a slowly progressive
hypertension

Here, then, we have a story of a man who was completely
disabled by arthritis until unexpected relief followed an opera-
tion on the gallbladder (presumably a cholecystostomy)   A
long period of relief was followed by recurrence, and the recur-
rence of symptoms persisted for a year and a half in spite of
many therapeutic efforts   Cholecystectomy was then per-
formed, and a pure culture of streptococcus obtained from the
gallbladder wall   The response to an autogenous vaccine
strongly indicated that this was the causative organism   His
gratifying recovery has now been maintained for nearly four
years

If one refers to a careful statistical paper like that of
Pemberton and Pierce,[1] one finds the gallbladder far down
the list in regard to the frequency with which it serves as a
major focus of infection in various arthritic conditions   Where
a certain focus seems to be a proven factor, teeth, nose and
throat, and genito-urinary tract head the list in order of fre
quency   The gallbladder is usually mentioned as a "rare"
focus

In a careful study of 200 cases of chronic arthritis, Hartung
and Steinbrocker[2] found that the incidence of gallbladder dis-
ease (4 5 per cent) was no higher than in any group of general
hospital admissions   In no case did the gallbladder seem to
be a factor in the arthritis

One finds many general statements, relative to this prob-
lem, naming arthritis as one of the "sequelae" that may follow

infection of the biliary tract [3]   Judd reported the results of a
rather large series of cholecystectomies in arthritics,[4] and felt
that the patients were somewhat relieved in about half the
cases

My own feeling, concurred in, I believe, by Dr Traeger
who conducts the arthritis clinic in this hospital, is that the
gallbladder may occasionally be the sole causative focus in
arthritis   In such cases the causative organism may be re
covered from the gallbladder wall (much less often from the
contained bile) and a vaccine made

The case that I have presented, it seems to me, offers
ample evidence that the gallbladder served as the sole focus
causing a very disabling arthritis   On two occasions, many
years apart, prompt relief followed first, cholecystostomy, and
second, cholecystectomy   Many other therapeutic efforts had
apparently been without benefit

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SYMPOSIUM ON DISEASES OF CHILDREN

The following clinics are included in this Symposium

CLINIC OF DR MILTON I LEVINE

NEW YORK HOSPITAL

THE DIAGNOSIS OF PULMONARY TUBERCULOSIS IN CHILDHOOD

THE diagnosis of tuberculosis in infancy and childhood presents, as a rule, much greater difficulty than in adult life

The difference in clinical manifestations lies in the fact that in children the usual type of tuberculosis found is that due to a primary infection   It must be remembered, however, that, irrespective of age, a primary or secondary infection pursues the same course, whether in children or adults

The frequency of primary infection in children has led the National Tuberculosis Association to classify this group as the childhood type of tuberculosis   Chadwick and McPhedran[1] have summarized the differences between the so-called "childhood" and "adult" types of tuberculosis as follows

Childhood type (primary infection)	Adult type (secondary infection)
Usually occurs in children Much less frequently in adults	Usually occurs in adults, but may be found in children
Result of a primary infection	Result of continued infection or re infection (endogenous or exogenous)
May be localized in any part.	Localization is usually in the upper third of the lung The first clinical manifestation is usually subapical
Associated tracheobronchial lymph nodes are always involved but may not be demonstrable in the living patient	Tracheobronchial lymph nodes not grossly involved by this reinfection, except sometimes in the terminal stage
Caseous lesions usually become calcified or encapsulated in fibrous tissue Occasionally a lesion progresses to excavation	Caseous lesions usually followed by exca vation or fibrosis or both.
Areas of infiltration commonly resolve, leaving trivial or no scars, except for foci of caseation which usually become calcified	Areas of infiltration may recede with the production of more or less fibrous tissue

The relative frequency, in children, of these two types of tuberculosis has been shown by numerous studies   Stewart[2] found that of 924 tuberculin positive children with intrathoracic lesions, 88 3 per cent presented the childhood type Watts[3] in a similar study of 539 children reported 95 per cent with the childhood type

In view of the dissimilar clinical pictures presented by these two types of tuberculosis it seems worth while to enumerate the different criteria employed in arriving at a diagnosis, and to evaluate their significance

1 Tuberculin reaction
2 Roentgenographic examination
3 Laboratory examination
4 History
5 Physical signs
6 Symptoms
7 Progress
8 Elimination of other causes

THE TUBERCULIN REACTION

The earliest evidence of a tuberculous infection and the most constant evidence is the presence of a positive tuberculin reaction   It must be remembered, however, that this test is only an index to a past or present infection, and merely repre-

sents a sensitization to tuberculo protein, and does at no time, by itself, indicate an active disease process

A positive skin reaction to tuberculin may occur from two to ten weeks after the onset of a tuberculous infection, and usually averages about six weeks This is considerably earlier than the development of any positive x ray or laboratory find ings It is, therefore, important in a child who shows only a positive tuberculin test and no other signs or symptoms, to continue close observation by x ray and physical examination

There are at present three methods of tuberculin testing commonly used throughout the world The cutaneous or Pirquet test, the intracutaneous or Mantoux test, and the per cutaneous or Moro test

Of these three methods the most consistent and most accurate is the intradermal test

A detailed description of the technic employed in applying the Pirquet and the intradermal tests may be found in any recent textbook on pediatrics, or in the publications of the National Tuberculosis Association [1] [4] The method employed in the patch test has been described by Wolff [5]

The advantage of the cutaneous or Pirquet test are, first, the simplicity with which it is performed, and the fact that un diluted old tuberculin remains stable for long periods of time

The percutaneous test, known also as the inunction test, patch test, or Moro test, has not been used to any degree in this country It has, however, been in use in various European clinics for the past ten years It consists of applying tubercu lin ointment to the skin It is said to have several distinct advantages First, there are no systemic reactions Then, the ointment is stable and easy to apply, and, also, there is much less psychic disturbance than with the intradermal test

The Mantoux or intradermal test is by far the most sen sitive method used This is performed by injecting a dilution of tuberculin in isotonic salt solution into the epidermis A dilution of 1 1000 is not only safe but entirely satisfactory as an initial dose One tenth of a cubic centimeter of this solu tion (0 1 mg) is injected, a small wheal resulting The reac

tion is read in forty-eight hours, to eliminate the pseudoreac
tions which may appear in twenty-four hours   A positive
result is shown by an area of redness and infiltration   If
there is no induration or if the reaction is less than 5 mm in
diameter it may be considered negative   Barnwell and Pol-
lard[6] found, in a study of 212 tuberculin positive children,
that 96 per cent reacted to 0 1 mg and under, the remaining
4 per cent reacting to 1 mg

In the presence of a history of marked contact, it is advis
able to start with a 1 10,000 dilution (0 01 mg) to prevent
severe reactions   However, out of more than 7000 cases
studied at Bellevue Hospital by Smith[7] only three or four
cases of the severe necrotic reaction occurred although almost
all received 0 1 mg tuberculin as the initial dose

Recently a purified protein derivative of old tuberculin,
devised by Seibert, has been placed on the market   This
comes in tablet form, and has the advantage of being of uni-
form potency   Samples of good old tuberculin are approx-
imately equal in strength to 1 per cent solution of the protein
Long, Aronson and Siebert,[8] Mariette and Fenger,[9] Stewart,[10]
and many others have testified as to the value of the protein
derivative

The greater accuracy of the intradermal test over the other
methods of tuberculin testing has been demonstrated by the
following authors   Smith,[7] Hamburger,[11] Reiss,[12] Krogs
gaard[13] and Hille [14]

Interpretation of Tuberculin Reaction —The size and
intensity of the tuberculin reaction does not indicate either the
extent or the activity of the infection   The reaction only
denotes the allergic response of the skin to the protein of tuber-
culin

In our study of children from tuberculous homes in New
York City, under the auspices of the Department of Health,
we have followed almost 1500 cases, tuberculin testing them
at three- to six-month intervals   No relation between the
tuberculous activity and the skin reaction has been found

Recently Viethen[15] on a study of 410 children reported

that generally the skin sensitivity remained the same or increased even with progressive healing   He concluded that the actual degree of allergy did not show any relation to the clinical course

This opinion is counter to certain papers on the subject, but the authors who felt the reactions suggestive of various phases of tuberculous activity have not, as a rule, followed the children over a long period of time.   Most of them have done single tests, when the children entered the clinic or hospital

Anergy During Acute Disease, Etc—There may be, during the acute stage of certain of the infectious diseases, a definite depression in the sensitivity of the skin to tuberculin   These conditions include scarlet fever, measles, diphtheria and pertussis   Evidence has been reported by a number of investigators [10] [17] [18] [19]   Other reports have been made concerning decreased sensitivity to tuberculin in such conditions as lymphogranulomatosis, diseases of myeloid and lymphoid tissues, and in patients with malignant disease [20]

There have also been numerous reports showing the depressant effects of ultraviolet and roentgen rays on the tuberculin reaction, and a number of reports on seasonal variation

However, it is to be borne in mind that the size and intensity of the tuberculin reaction are of little consequence as long as the test is positive—and, as a rule, during infectious diseases the reaction remains positive even though it may reduce in size and intensity

Duration of Skin Sensitivity—For many years it was held that a positive tuberculin reaction was a constant factor which, once established, was maintained permanently   Although as a general rule this impression is correct, we know today that a certain number of positive reactors do become negative after an indefinite period of time, in the absence of further contact   Lloyd and McPherson [21] testing 700 tuberculin positive children found 4 per cent becoming negative to the tuberculin test after one and one half to two years

Tuberculin (Human vs Bovine)—Although the bovine and the human tuberculosis organisms are separate entities

easily distinguished, one from the other, by cultural differences and dissimilar reactions in man and guinea-pig, the tuberculin formed by each is very similar   It has been shown that practically every case of bovine tuberculosis shows a positive skin test with human tuberculin and vice versa

Krause and Baldwin[22] through anaphylactic sensitization and intracutaneous tests demonstrated a relationship between the various types of tuberculin   These tests indicated that pure extracts of human, bovine, and avian bacilli interact closely   Agglutination tests and complement fixation tests have been shown to furnish similar biophysical relationship

Baldwin, Petroff, and Gardner[23] feel that in cases where dissimilar skin reactions were found, after using human and bovine tuberculin, that probably the quantitative relations were unequal with reference to the amount of bacilli present in cultures used in preparing the tuberculins

ROENTGENOGRAPHIC FINDINGS

Next to the finding of tubercle bacilli, the roentgenogram offers what is probably the most important step in the diagnosis of pulmonary tuberculosis   However, its interpretation is often one of greatest difficulty since certain of the lesions found on x-ray in the chests of children with active tuberculosis may be simulated by other conditions entirely non tuberculous

When definite x-ray pathology is present but the tuberculin test is negative, one can rule out a tuberculous infection, unless the infection is overwhelming causing an anergic condition On the other hand, a positive tuberculin test in the presence of x-ray pathology should not be overemphasized

It is of the utmost importance that pictures be taken under the optimum conditions   Macklin and Hudson[24] by a series of moving pictures showed that during expiration, the hilus rises and broadens, presenting a picture quite different from that seen during inspiration   This demonstration showed the ease with which a false diagnosis of enlarged tracheobronchial nodes could be made   To avoid these and other misinterpre-

tations it is advisable that all plates be taken with the chest in complete inspiration

All plates should be taken at a six foot target film distance. This eliminates many confusing and misleading shadows of the hilar and mediastinal regions present in films taken at shorter target distances. In order to bring out the calcium deposits clearly, films should not be underexposed (soft)

We have found, in our studies, that oblique views of the chest are of the greatest importance in the study of children's lung pathology, especially in the determination of enlargement of mediastinal nodes. These also bring out clearly any calcifications which might otherwise be indistinct due to overlying structures in the anteroposterior position

In cases where there is the least suspicion of activity, roentgenographic examinations should be made at fairly frequent intervals. Children who show only a positive tuberculin test should receive an x ray at least every six months to a year, in order that any sign of activity may be observed immediately

To interpret adequately the chest findings as portrayed on the roentgenogram one must have a clear concept of the course and pathology of a tuberculous infection

In the vast majority of cases the organism enters the body by inhalation and is carried through the bronchial tree to the terminal bronchioles, usually subpleural, where a focus of tuberculosis is set up. This is known as the primary focus. From this area organisms are carried back through the lymphatics to the lymph nodes draining the region, producing an enlargement of the regional and tracheobronchial nodes. The primary focus as well as the regional nodes at the root usually undergo caseation with following encapsulation and calcification. In a small percentage of cases the condition may progress instead of subsiding

The results of the primary infection depend largely on the dose of tubercle bacilli. There may be complete absorption without any discernible lesion if only minimal doses are received. Moderate doses usually form a primary complex with

a perifocal area of inflammation often resembling on x-ray the typical picture seen in nontuberculous pneumonic infections Massive doses of organisms may cause the development of a caseous pneumonic process with cavitation   This latter type is unusual

Massive exposure or the breaking of a caseous lesion into a blood vessel may give rise to an hematogenous infection with resulting generalized miliary tuberculosis usually resulting in death   We know now that all cases diagnosed as miliary tuberculosis are not necessarily fatal, but that occasionally we get disseminated exudative lesions which disappear completely

An exogenous or endogenous reinfection of the lung gives rise to the type of infection known as the adult type of tuberculosis, which reacts in children very much the same as in adults

Wood[26] has graphically represented the course of a primary infection as follows
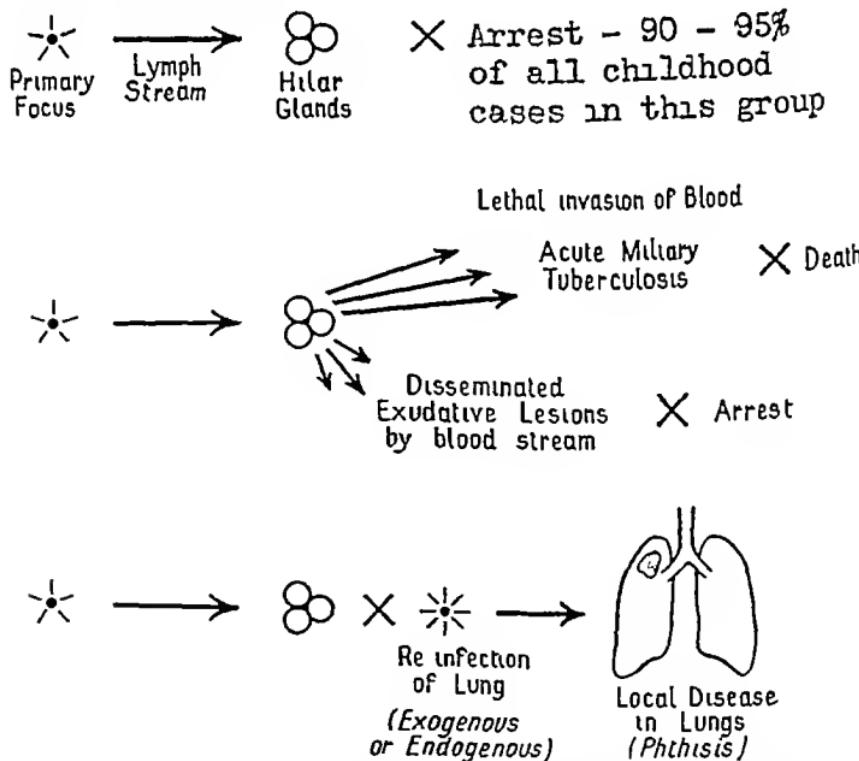
Fig 85 —Diagrammatic representation of the probable course of events following primary infection   (W Burton Wood, The Lancet, Oct 7, 1933)

ROENTGENOGRAPHIC INTERPRETATION OF PRIMARY COMPLEX

The Primary Focus —The primary focus is not always visualized by x ray examination This may be due to a number of different factors The lesion may be so small as not to be seen Bigler[26] has stated that a primary focus can rarely be demonstrated "unless it is from 1 to 1 5 cm in diameter, is situated near the lateral wall of the chest and not behind the

Fig 86 —B P, aged sixteen month October 8 1930 Primary infection type of tuberculosis This plate shows an acute exudative lesion in right lung with enlargement of regional and hilar nodes

diaphragmatic shadow, is surrounded by a definite area of bronchopneumonia or atelectasis, or contains calcium "

The primary lesion may be situated in any part of the lung, and when seen on x ray may be of almost any size, varying from a small area to a consolidation of an entire lobe, depending on the amount of infiltration about the original focus No idea either of the size of the focus or of the prognosis can be gained from the picture

The roentgenographic appearance of primary lesions is not especially typical, often being rather difficult of differentiation from the pictures of nontuberculous pneumonia   It often appears as a homogeneous shadow which, as a rule, gradually clears toward the focus   Occasionally the condition clears in the central portion first and may be confused with cavity formation   The appearance of the subsiding infiltrative area depends on the position of the focus relative to the x-ray plate
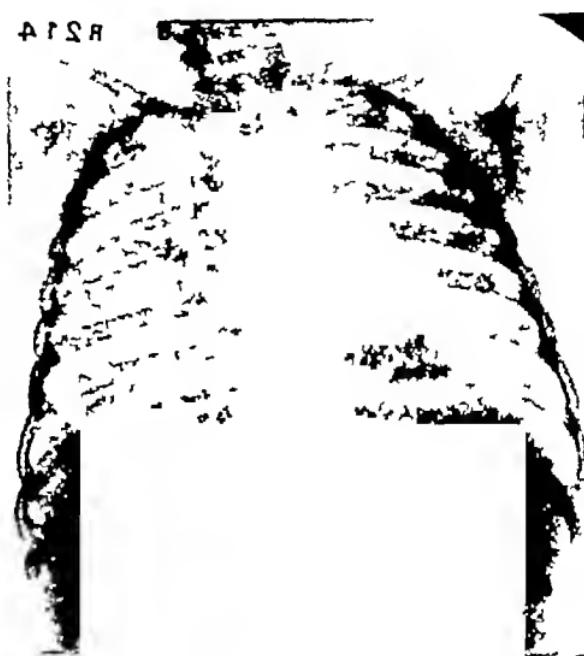

Fig 87 —B P , aged twenty-two months, April 27, 1931   Exudative process resolving   Enlarged regional and hilar lymph nodes with beginning calcification

If the focus is situated in the lateral portions of the lungs it will usually present a triangular shadow with the base toward the periphery and situated within a single lobe

When these areas of infiltration finally resolve, one or more calcified nodes may appear, although sometimes not until much later

The more or less recent lesions usually have some infiltrative process surrounding them   This causes a soft shadow on x-ray with a poorly defined, hazy margin   There is usually

an irregular outline to the process and the shadow is of vary
ing density

On the other hand, old healed or inactive lesions lack the
surrounding infiltration and are therefore sharply demarcated
and cast a dense opaque shadow

Primary focus tuberculosis is always associated with hilar
adenopathy which usually casts a definite shadow on x ray
The lesion at the hilum is always larger than the primary

Fig 88 —B P, aged thirty two month February 3 1913 Primary complex
right lung with calcified peribronchial and paratracheal nodes.

lesion These very enlarged nodes serve as a differential point
in diagnosing a tuberculous condition from ordinary bron
chiolar lobar pneumonia

Tuberculous Hilar Nodes —The spread of bacteria
through the lymphatic drainage from the primary focus to the
regional lymph nodes has already been mentioned

As a rule the shadows cast by the enlargement of these
nodes can be clearly seen, but occasionally they are found

only on postmortem examination   It is important that oblique
and lateral plates should be taken as well as the usual antero-
posterior plates, since many cases with enlargement in the
posterior .mediastinum can be diagnosed only by lateral or
oblique view

Unless areas of calcification are seen it is impossible to
diagnose a hilar adenopathy as tuberculous, since many other
conditions in childhood may cause a similar enlargement   Only
too often the interpretation of these chest pictures is influenced
by previous knowledge of a positive tuberculin test   An *x*-ray
diagnosis of tuberculosis of the hilar nodes should depend,
therefore, not only on the skin test but on the history, physical
and laboratory findings

The shadow cast by an enlargement of the paratracheal or
hilar nodes is usually quite definite in outline although the
density of the shadow is often not homogeneous   In the hilar
region the shadows may extend out in a somewhat triangular
fashion with the base toward the central line   In the para-
tracheal region the nodes often take on a bulging appearance,
although there are cases where the differentiation from a
thymic enlargement is most difficult   A lateral plate will settle
this problem since the thymus is in the anterior mediastinum
and enlarged nodes in the posterior mediastinum   Left-sided
mediastinal adenopathy is sometimes difficult to observe on
x-ray due to the heart shadow

Later these nodes become caseous and finally proceed to
calcification, giving typical sharply demarcated dense shadows

Miliary Tuberculosis —This condition is caused by a bac-
teremia of tubercle bacilli, which follows the erosion of a
primary focus, lymph node, caseous cavity, or any extrapul-
monary tuberculous disease such as bone or kidney, into a
blood vessel   The result is a generalized tuberculous infection
which is usually acute   However, there may be a continued
slow leakage into a blood vessel producing a subacute or
chronic picture   It may be fatal or resolving, depending on
the number of organisms discharged into the circulation and
the extent of tissue sensitivity to the tuberculous antigen

The x ray pictures of the lungs in miliary tuberculosis show many variations depending on the number of tubercles formed, the degree of exudation, and the progress of the condition

At the outset a haziness appears over the whole lung area This gradually takes on the picture of many small pinhead shadows and eventually through exudation and overlapping the lungs take on a studded or stippled appearance It involves all
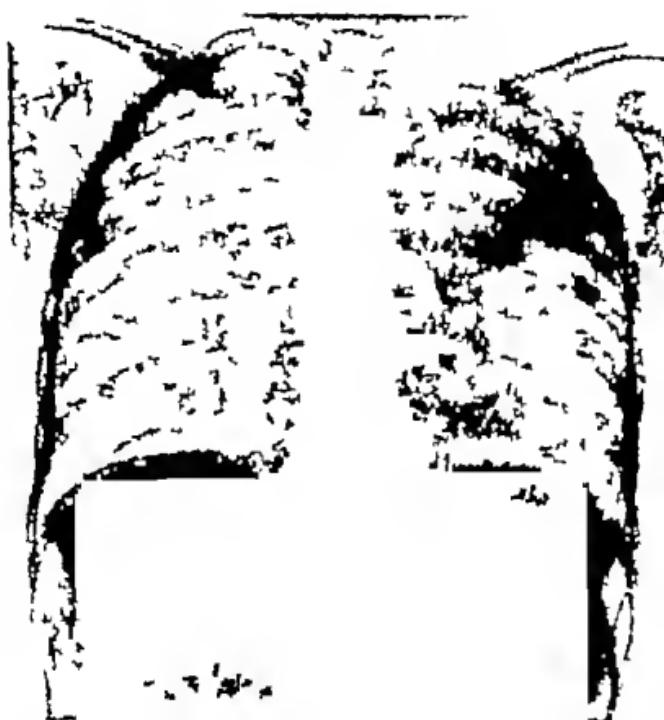

Fig 89—C C, nine years September 9 1931 Diffuse hematogenous process (miliary tuberculosis) with extensive exudative process in left upper lobe

portions of the lungs equally, even in apex and costophrenic regions

In cases where there is a miliary caseating bronchopneumonia, areas of exudation arise about the miliary foci, causing a picture with the tubercles blurred and poorly defined due to the surrounding exudation In these cases the shadows are usually large depending on the degree of coalescence of the lesions

For a long time it was felt that all cases of miliary tuber culosis were fatal However, numerous cases have been re ported, and almost every person dealing with groups of tuber culous children has seen cases diagnosed as miliary tuberculosis subside Some of these leave calcified spots through the lung, others leave a fibrotic process In certain cases the con dition clears up entirely by x-ray In this latter group the

Fig 90 —C C, ten years, September 22, 1932 One year later Complete clearing of disseminated tuberculosis with considerable resolution of process in left upper lobe This patient subsequently made a total and uneventful recovery with a residual fibrosis in left apex

individual foci may still remain, but be too small for roentgenographic determination

Occasionally the miliary shadow is closely simulated by certain forms of nontuberculous pneumonia, frequently of influenzal variety If these roentgenograms reveal no calcifications and the lesions are not sharply demarcated one must look to the peripheries for diagnosis If the outer third of the lung, the apices and the costophrenic area show disseminated lesions

the condition is much more likely to be tuberculous in nature than if these areas were clear

Epituberculosis or Perifocal Exudative Inflammation—The term, epituberculosis, is used to distinguish a benign exudative lesion of the lung tissue extending out from a tuberculous hilum. It is considered as an allergic response of tuberculin sensitive lung tissue to a sudden influx of tuberculin, rather than to an infection by the organism

Fig 91.—H Y aged fifteen years. Healed calcified disseminated tuberculosis. This condition was found accidentally on routine examination. Patient never had any complaints which might have suggested a tuberculous infection (Service of Dr Bela Schick, Seaview Hospital.)

It usually appears in the late primary or early secondary stage of infection when the hilar nodes have enlarged, and is seen as a triangular, bulging, or irregular shadow extending out from the hilum toward the periphery of the lung. When triangular in shape, the base is situated centrally with the apex extending outward

The reaction is exudative in nature similar in every way to the exudation occurring around a primary focus from which

it may not be distinguishable if both are present at the same time

The shadow is usually dense and homogeneous, and can not, by a single x-ray plate, be differentiated from a non tuberculous pneumonia   As a matter of fact many cases of epituberculosis were, in the past, diagnosed as unresolved pneumonia


Fig 92 —D L , aged twelve years   Bilateral widely disseminated broncho genic spread   This type with its small discrete areas is often mistaken for a generalized hematogenous or miliary tuberculosis   However, the true miliary tuberculosis involves all portions of the lungs, whereas in this plate the apices and bases are clear   This patient subsequently showed complete resolution with clinical recovery   (Service of Dr Bela Schick, Seaview Hospital)

If the infiltration does not involve a whole lobe it fades off gradually into the lung tissue

The condition is usually more or less chronic, the infiltration lasting anywhere from several weeks to months, and occasionally even years

The following factors differentiate the exudative lesions from those of nontuberculous pneumonia

	Exudative tuberculous infiltration.	Nontuberculous pneumonia.
Onset.	Similar to acute upper respiratory infection. Condition often found by x ray on apparently normal child	Usually acute with high remittent fever
Tuberculin test.	Always positive.	May be positive or negative. All cases with positive tuberculin reactions must be considered tuberculous unless proven otherwise, if the x ray evidence of pulmonary infiltration persists after the clinical illness subsides
Tracheobronchial nodes.	Almost always enlarged	Seldom enlarged.
Dyspnea.	None.	Most frequently
Condition of patient.	Usually without any apparent sign of toxicity	Often toxic.
Duration of infiltration	Usually continues for months	Usually resolves within several weeks.
Resolution or consolidation	Always takes place slowly	Rapid resolution.

Tuberculous Bronchopneumonia —This condition is occasionally seen in children, resulting from an overwhelming infection and originates from the primary focus or from the infected lymph nodes It usually occurs as the result of a caseous lesion breaking into a bronchus

The picture seen on the x ray plate depends upon the manner of dissemination, upon the number of organisms scattered, and upon the activity and progress of the condition

All stages of tuberculous reactions may occur with exudation, caseation, cavitation, and calcification

The shadows cast by these lesions are usually considerably larger than those of miliary tuberculosis, and become more so as the condition progresses and the infected areas coalesce The individual areas are not clearly defined due to the infiltrative process about the individual focus The lesions are not necessarily scattered through both lungs as is the case in miliary tuberculosis

The condition may spread and involve large portions of the lung, and cavitation may develop

In infants and younger children this type of infection is usually fatal

The differentiation of tuberculous bronchopneumonia or lobular pneumonia from nontuberculous pneumonia is a frequent problem   The similarity of the shadows on x-ray force us to turn to the signs and symptoms and laboratory findings for assistance

The following should be considered

	Tuberculous caseous pneumonia.	Nontuberculous pneumonia
Onset.	May be acute or insidious	Acute
Toxicity	Varying, may be slight except in latter stages	Moderate to marked toxicity
Duration of fever	High for several weeks, then low grade fever for several months	Fever seldom lasting more than several weeks unless complications set in
Physical signs	Râles not as numerous as in nontuberculous pneumonia	Râles numerous as a rule.
x-Ray	Enlarged hilar nodes usually present	Enlarged hilar nodes seldom present
Sputum.	Almost always positive Gastric lavage or stool	Negative
Blood count	High monocyte count As condition subsides a relative lymphocytosis may appear	Leukocytosis with polynucleosis
History	Often of tuberculosis contact	Seldom of tuberculosis contact
Tuberculin test	Almost always positive except in overwhelming infection	May or may not be positive
Duration of process	Chronic—weeks, months and even years	Usually subsides within a month

As has already been mentioned in children with a tuberculin reaction, pneumonias which persist on x-ray after all clinical illness has subsided must be considered tuberculous until proven otherwise

Adult Type Tuberculosis —"Adult type of tubercu-

losis" describes the reinfection type of tuberculosis, most frequently seen in adults Specifically it refers to the tuberculous process of infection either exogenous or endogenous The differences in reaction between this and the primary complex type have already been described

Ornstein, Ulmar, and Dittler[27] have classified the various types of adult tuberculosis as follows (1) Exudative, (2) caseous pneumonic, (3) exudative productive, and (4) chronic proliferative These classifications explain not only

Fig 93 — M R., aged ten years May 24 1933 Healed primary No clinical tuberculosis

the pathological condition of the lesion but also give some prognostic value to the diagnosis All of these types may occur in children as well as in adults but being the result of a secondary infection are more likely to be found in adults

This secondary type of tuberculosis differs from the primary type in that the hilar lymph nodes are much less frequently involved the localization is usually in the upper third of the lung fields and there is more tendency to fibrous encapsulation and fibrous healing

The exudative type presents a picture very similar to that seen in epituberculosis or the pneumonic processes surrounding a primary focus   The exudative lesion, as it disappears, usually leaves no evidence behind since it is only a serous response of an extremely allergic lung, and has suffered no tissue injury

The caseous-pneumonic type may appear as similar to the exudative type on x-ray   However, the toxicity of the patient,

Fig 94 —M R , aged eleven years, July 26, 1934   Adult type tuberculosis on childhood base   Far advanced adult type caseous pneumonic tuberculosis of right upper lobe with large excavations, spill into remainder of right lung and to left   Fatal termination shortly after

the course of the infection which usually becomes more severe, and the formation of cavities, progression, and atelectasis with fibrous scarring in patients who recover are the diagnostic points

The exudative-productive type is the form which may look like a caseous pneumonic process but where instead of going on to cavitation, the exudation is absorbed leaving fibrous strands of scar tissue   The condition is a chronic one lasting

months and even years, and recovery from this type is not infrequent.

The chronic proliferative type is a long drawn out, slow process A discrete type of shadowing, often nodular in shape is seen on x ray This form may spread gradually throughout the entire lung Occasionally the disseminated type of this condition is confused with miliary tuberculosis

LABORATORY DIAGNOSIS

The laboratory findings are of primary importance in the diagnosis of pulmonary tuberculosis in children

At present, the only absolute finding indicative of an active disease process is the identification of the organism in the sputum of the child The complement fixation test, the blood sedimentation time, the monocyte count, and other measures have been used as aids at diagnosis, but so far no test has been devised of any distinct accuracy

Children, as a rule, do not expectorate their sputum It is coughed up and swallowed To obtain it, therefore, one must either lavage and examine the stomach contents, or examine the stools

The method of gastric lavage is most widely used and is very dependable Poulsen and Andersen [9] in a study of 622 children with positive tuberculin reactions found 199 with tubercle bacilli in the gastric lavage material Of 54 tuberculin positive children under one year of age 87 per cent had the organisms in the stomach contents They reported that by the method of gastric lavage a diagnosis was made in 15 per cent of children who showed no x ray or auscultatory signs of pulmonic involvement

If no organisms are found in the stomach contents the stools should be carefully examined The method of examination suggested by Petroff [7] is probably the most effective. The morning stools are collected, diluted with water, stirred, and strained The liquid stool is saturated with sodium chloride crystals and allowed to stand at room temperature for several hours At the end of this time the bacteria will

float upon the surface and the scum can be collected with a sterile spoon   This is then treated with normal sodium hydroxide, shaken well and incubated for one to two hours at 38° C   Then the specimen is centrifuged, the supernatant fluid decanted and to the sediment is added 3 to 4 drops of normal hydrochloric acid   This sediment is then examined for organisms, by staining, culture, and animal inoculation

A few years ago Lowenstein[30] perfected a culture medium by which he claimed to grow tubercle bacilli directly from the blood of a large percentage of tuberculous patients   This medium, although of unquestioned value in the culture of the tubercle bacilli, has not given as high a percentage of positive blood cultures in tuberculous children as had been hoped for Mishulow[31] feels that the Bordet-Gengou medium is somewhat more sensitive than the Lowenstein medium, but feels that both should be used in conjunction with one another

Before referring to culture and inoculation methods a word of warning as to diagnosis by staining alone should be sounded Namely, it should be remembered that there are other acid fast bacilli which may be mistaken by microscopic examination for the pathogenic tubercle bacilli   Among these are the grass bacilli, isolated from grasses and often found in milk, the smegma bacilli, often found in urine and in feces   This bacillus is a normal inhabitant of animals, including man, being found where sebaceous grease is abundant, as about the orifices of the body, especially the genitalia, the paratubercle bacilli, being acid-fast organisms found occasionally in lung gangrene, pustules and abscesses, in tonsillar crypts and naso pharyngeal discharges, the acid-fast bacilli in water, occasionally found in tap water or water that has been exposed to air for some time   The organisms are probably grass bacilli

The question of the relative values of animal inoculation and culturing has been the source of frequent discussion   It is my feeling that with improvements in the methods of culturing this will supersede the use of animals   Recently Mishulow, Romano, Melman and Kereszturi[31] examined the sputum of 133 patients where the sputum was negative on

microscopic examination Equal amounts of the same speci men were injected into guinea pigs, and plated on Bordet Gengou and Löwenstein media They reported 11 3 per cent positive on Bordet Gengoux media, 9 8 per cent on guinea pig inoculation and 6 8 per cent on Löwenstein's media These authors feel that the culture method is more dependable than animal inoculation due to frequent deaths and infections of guinea-pigs, other infections in animals which may resemble tuberculosis, the fact that a minimal number of virulent tuber-culosis organisms may not cause infection in the animal, and lastly the difficulty of small laboratories in keeping animals They point out also that a positive culture can be obtained within a few weeks whereas it takes one to three months for tuberculous infections in guinea pigs to become manifest It is probably advisable to use both animals and cultures wherever possible, checking one with the other

A great deal of work has been done to determine any diag nostic changes in the blood picture that may occur in tuber culosis

Since Sabin and her co-workers in 1925[2] showed with the supravital technic that the primary effect of the tubercle bacillus was on the monocyte of the connective tissue and blood, a number of authors have reported blood pictures from this angle Carl H Smith[33][34] has shown that the monocyte count, while it does not perform the function of a diagnostic test in tuberculosis, does supply more information on clinical activity than can be obtained from the complaints of patients or physical examination, and even the roentgenogram

In general, it may be said that the peripheral blood of an ambulatory child with a positive tuberculin test where the in fection is quiescent or arrested is usually similar to that of a normal uninfected child except that occasionally a lympho-cytic increase is found, indicative of a tuberculous resistance During activity of a tuberculous infection, however, the white cell count is increased there is an elevation of polymorphonu clear neutrophils and monocytes a drop in the number of eosinophils and lymphocytes, and a rising monocyte to lympho

cyte ratio   The monocyte count is most valuable in children under the age of four years since during infancy and early childhood the monocytes are much more easily called forth than later in life

When a tuberculous infection heals or is arrested the lymphocytes are found to be increased in the peripheral blood, and the monocytes decreased, a more normal ratio occurring

Smith[33, 34] reports the normal monocyte to lymphocyte ratio (M/L—per cent monocytes/per cent lymphocytes) as increasing with age from 0 09 in infants under one year, to 0 25 in children over the age of four years   On the basis of his data, this author, in an attempt to establish a numerical guide to the earliest manifestations of activity, suggests a tentative monocyte percentage of 14 per cent and above, together with the percentage of lymphocytes to yield an M/L ratio of 0 5 or more

The platelet count in the tuberculous patient is also not diagnostic but more of an index of activity   Brock[35] found that in general the number of platelets increases in clinically active tuberculosis and returns to normal limits with the subsidence of activity   When, however, the infection was overwhelming, the platelet count was often markedly depressed This author feels that a rise in platelets occurs so constantly in tuberculosis that it may be of diagnostic value in differentiating it from other forms of pulmonary disorder

Complement Fixation and Sedimentation Test—Any number of modifications of the complement fixation tests for serological diagnosis of tuberculosis have been published However, none of these has reached the importance of the Wassermann test in syphilis   With all of these variations a considerable number of positive reactions are obtained in non-tuberculous children   Joppich[36] has reported on 30 modifications of the complement fixation tests

The sedimentation test is also lacking in reliability   Although the rate is often accelerated by onset of exudative lesions and rapid progress of pulmonary tuberculosis, there are many cases of activity where the values remain normal

Friedlaender[37] reported on a series of 100 children between two months and twelve years with positive tuberculin reactions Sixty seven of these patients had active tuberculosis Of these 67 children, 24 had consistently normal sedimentation rates Furthermore, normal values were found in 17 of 48 patients in whose gastric contents tubercle bacilli were found

HISTORY

A careful history will often give supplementary evidence in support of a diagnosis of pulmonary tuberculosis In certain cases the tuberculin test may be found positive and the x ray of the lungs suggestive It is in such cases that the history proves of greatest value

Inquiry should always be made concerning any possibility of a person intimately associated with the child having signs of tuberculosis such as chronic cough, fatigue, and loss of weight.

Frequently, on going into the history, one finds nurses and domestics with these signs who have lived or are living at the home of an infected child The chronic bronchitis of old age is often tuberculosis

Examination of every person in the immediate household is essential, lest an unknown source of infection be present, and continuing to infect the child Rathbun found nine times as many cases of tuberculosis in exposed children as were found in nonexposed Opie and McPhedran[28] found seven times as many

Occasionally, where a question of an infection with the bovine tuberculosis organism arises, it is important to obtain information concerning the source of the child's milk supply

PHYSICAL SIGNS

It is often remarkable how few physical signs are present in certain cases of pulmonary tuberculosis in children, where massive lesions are present

The x ray may show consolidation involving the greater

part of a lobe, and still on physical examination only a slight diminution in breath sounds and a few inconstant râles may be heard

Stewart,[2] on the basis of a study of 1835 children with positive tuberculin tests, examined at the Lymanhurst School for tuberculous children in Minneapolis figured that if 100 per cent is assigned to the tuberculin test as a measure of efficiency in the discovery of childhood tuberculosis, the roentgen examination has a reliable efficiency of about 25 per cent, and the physical examination an efficiency of a small fraction of 1 per cent

Certain authors have tried to draw up a picture of a tuberculous child They have spoken of malnutrition, narrow chests, winged scapulae, delicate features, long lashes, general fine hairiness over the body, *et cetera* None of these signs is, in any sense of the word, dependable for diagnosis

One often finds well-developed and well-nourished children apparently in good general health, who not only have a positive tuberculin test but definite x-ray signs of an active tuberculous process

As a matter of fact it is interesting to note, that in a group of older children studied by Barnard, Amberson and Loew[39] at the Bellevue-Yorkville Center in New York, those known to be infected with tuberculosis had a higher weight average than those who were nontuberculous

The enlargement of the mediastinal nodes is also very obscure when an attempt is made at diagnosis by physical examination alone Unless a node presses on the trachea so as to obstruct breathing there are usually no definite signs referable to this adenopathy Enlargement of the nodes cannot be made out on percussion either on the anterior or posterior chest wall The D'Espine's sign is not sufficiently dependable for adequate reliance

Eberson, Delprat and Wolff[40] comparing the physical signs found on children with positive tuberculin tests as compared with those with negative reactions found the following

	206 tuberculin positive cases.		100 tuberculin negative cases.	
	Number	Per cent.	Number	Per cent.
D Espine's sign	150	82	78	88 6
Paravertebral dulness	111	60 6	71	80 7
Manubrium sternal dulness	51	27 9	20	22.7

Physical Signs of Tuberculous Parenchymal Lesions

—The parenchymal lesions found most frequently in children are those of the primary complex with its exudative infiltration, and the condition known as epituberculosis where a similar exudative infiltration is found but usually with a hilar node as a focus

The physical signs of these lesions are relatively inconspicuous Even with extensive involvement one may find only diminished breath sounds in a few transient fine rales The percussion note may show some dulness, but often this is also absent

The physical signs of pleural effusion, tuberculous bronchopneumonia and cavitation are similar to those found in adults

In cases of miliary tuberculosis the signs may be entirely lacking, or may be very indefinite Occasionally one may find scattered fine rales throughout the chest In some cases the percussion note is somewhat tympanic

SYMPTOMS

The symptoms shown by children with the childhood type (primary complex type) of tuberculosis are usually very few Although there may be an active and progressive lesion, a child may manifest nothing indicative of the infection

Probably lassitude and the development of a chronic low grade temperature are the most common symptoms although these may be found in many other conditions of childhood such as sinusitis, nontuberculous adenitis and nasopharyngeal infections

Night sweats are not to be considered as a symptom of

any value since many normal children perspire profusely at night

Coughing, loss of appetite, colds, failure to gain are also so common in other childhood conditions that their presence is not especially significant

Eberson, Delprat and Wolff[40] studying the past histories of 206 positive tuberculin children found the following

	206 tuberculin positive cases.		100 tuberculin negative cases	
	Number	Per cent	Number	Per cent.
Cough	63	41 8	32	55 2
Nervousness	63	41 8	23	39 6
Lack of appetite	47	31 2	21	36 2
Loss of weight or failure to gain	46	30 5	14	24 1
Fatigability	35	23 2	14	24 1
Night sweats	33	21 9	13	22 4
Colds	29	19 2	10	17 2
Lassitude	17	11 3	4	6 9
Elevation of temperature	3	2 0	4	6 9

Hemoptysis, so often found in adults, is extremely rare in children

During exudative infiltrations there are usually few, if any, symptoms Occasionally one finds mild early symptoms similar to an upper respiratory infection or influenza Following this onset there may be no symptoms whatever in spite of a massive pulmonary infiltration

The symptoms during the reinfection type (adult type) of tuberculosis are the same in children as in adults

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CLINIC OF DR. PHILIP MOEN STIMSON

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RECENT DEVELOPMENTS IN THE COMMON CONTAGIOUS DISEASES

THESE are interesting years in the development of the science of the contagious diseases, for every year brings new steps forward, new fields opened for exploration, new vistas of the future. It is true that the clinical aspects of many of the communicable diseases have been known for centuries. Hippocrates described with amazing accuracy an epidemic of mumps complicated by orchitis. Of this group of illnesses only poliomyelitis was not clearly identified till toward the end of the last century. But is was not till the discovery of bacteriology by Pasteur and the subsequent growth and development of serology and immunology during the last half century or so, that a true understanding was developed of these various diseases and their management. And although each year of late has brought new information of great importance, there still are many paths ahead that lead to much uncertainty, many discoveries that are still to be made. For instance, how, in a practical manner, can children be tested for immunity to such troublemakers as measles, mumps, chickenpox, and especially poliomyelitis? How can one immunize permanently against many of these diseases? How can the ultramicroscopic viruses be put to work to defeat their own evil results?

However, a much lauded advance may prove but a development of an idea which was tried out many years ago. For instance, in 1759, Francis Home in England tried the experiment of inoculating susceptible children with blood ob-

tained from measles patients, and succeeded in obtaining a modified measles, which was in his own words a "much milder disease than the natural" His report gives a fairly accurate description of the modified measles we are now seeking to accomplish [1]

Viewed from certain aspects, the common contagious diseases can be divided into two groups, such as the frankly bacterial diseases in contrast to the so-called "virus diseases" In the former group fall diphtheria and scarlet fever, while among those listed in the latter group are smallpox and chickenpox, measles and rubella, mumps, poliomyelitis, and now influenza The virus diseases have certain features in common, in contrast to the bacterial group They are more contagious, the immunity conferred by an attack is more durable, the complication of a specific encephalitis is more apt to be present, antisera are useless after symptoms have developed, and at least until recently it has been impossible to immunize with killed virus

There has been considerable discussion as to which group whooping cough should be assigned The evidence that the Bordet-Gengou bacillus is solely causative of this disease has seemed conclusive, but recent observers such as McCordock and Rich have called attention to the marked similarity of the pathological lesions of the lung found in influenza, measles, and whooping cough, at least the former two of which are quite certainly due to ultramicroscopic filtrable viruses In each disease the characteristic picture is present of a mononuclear cellular interstitial infiltration in the peribronchiolar areas, and in each disease intranuclear inclusion bodies have been found Furthermore, of the features of virus diseases, a specific encephalitis is not uncommon in whooping cough, the disease is extremely contagious, anti-

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[1] Home wrote, "The former (modified measles) are not attended with that degree of fever which precedes the latter (the natural measles), nor with the cough want of rest, and other inflammatory complaints which attend it, nor with the sore eyes, cough, hectic fever or ulcerated lungs which so often follow it Inoculation appears to weaken the force of all diseases"

sera are useless, and one attack almost always confers an immunity However, recent experiments wherein monkeys and children have been given whooping cough by inoculation with pure cultures of the Bacillus pertussis, and the fact that vaccines made from this Bordet Gengou bacillus seem to be effective in protecting exposed susceptible children, furnish quite convincing evidence that the Bordet Gengou bacillus is the principal if not the sole cause of whooping cough, and that this disease should be listed in the bacterial group

The diseases may also be divided into groups by the extent of the passive immunities a newborn baby inherits from his mother, and these immunities do not coincide with whether the disease is bacterial or virus in origin Newborn babies are very susceptible to the common pyogenic infections, the upper respiratory infections, tuberculosis, and syphilis, tetanus and erysipelas, chickenpox and smallpox, and whooping cough, of which the two pox are presumably virus, the others bacterial or spirochetal in origin On the other hand, the newborn infant is resistant to diphtheria and scarlet fever, measles and rubella, mumps, and poliomyelitis The clinical observation has been expressed that the diseases to which the newborn child is resistant are virus diseases and those bacterial diseases in which symptoms are due to absorption of toxins, but this does not stand too careful an analysis because the two pox diseases are now thought to be due to elementary bodies which are filtrable viruses, and yet are diseases to which young infants are quite susceptible. The author has seen a case of chickenpox in a six weeks old baby albeit a very mild case and the disease has been reported at eleven days Medical histories speak of smallpox in prevaccination days as being a scourge of babies, and the newborn are certainly susceptible to vaccination In any case the immunity of the newborn is presumably present as a result of one of three mechanisms First, *placental transmission* either of antibodies (probably the principal factor in the production of the newborn's immunity) or of antigen (probably a negligible factor), or second *mammary transmission* through

either colostrum or milk, either of antibodies or of antigen, and convincing evidence of the existence of any mammary transmission is still lacking, or third, *tissue immunity* in rapidly growing tissue   McKhann in stating this proposition of the source of the newborn's immunity noted that the antibody content of umbilical cord blood corresponds to that of the mother's blood as to diphtheria antitoxin, scarlet fever anti toxic substances, measles immune bodies, and neutralization substances against poliomyelitis virus   He generalized by stating that the antibodies which have been demonstrated to pass the human placenta are antitoxic or antiviral in character

Following up this observation, he and his coworkers prepared placental extracts containing maternal and fetal bloods and placental tissue protein, in a 2 per cent sodium chloride solution, from which the globulins were precipitated with ammonium sulphate   The purified extract containing practically only the water soluble globulin (pseudoglobulin), he showed contained substances, presumably antibodies, which had four notable properties, if the mother's blood serum had these properties   They could neutralize diphtheria toxin, blanch scarlet fever rashes, neutralize poliomyelitis virus, and prevent measles in exposed susceptible patients   This fourth point has been put to practical use   Placental extracts have been made, both in experimental laboratories and in at least one commercial laboratory, and have been used similarly to convalescent measles serum, for the partial or complete protection of children who have been exposed to that disease   The results obtained have been at least so encouraging as to warrant a further continuance of this procedure, but government regulations have recently been established which have made the large scale preparation of such placental extracts difficult   Placental extracts have an advantage over human convalescent serum in being more nearly of standard potency, as a result of pooling a number of placentas in the preparation of the extract   The dosage, from 1 to 5 cc , depending on the results desired, and the length of

time since the exposure, is much smaller than that of human whole blood or adult serum

In this prevention or mitigation of measles, the use of another preparation, parental blood, has become quite well known and often adopted   Children known to have been exposed to measles now customarily receive at the earliest opportunity an injection of serum or blood from a patient who has had measles Sickly children and others whom it is desired to protect from any further illness whatever for the time being can quite uniformly be entirely protected from measles by 20 cc of parental blood serum or twice as much whole blood given intramuscularly, and not later than the fifth day of the incubation period, which is the fourth day after that of the first possible exposure This is usually as early as the exposure is known because the exposing case is not often diagnosed before the rash has appeared which is already the fourth day of infectivity

In most instances it is desired not to give an exposed child complete protection to measles, but rather to lessen the severity of the oncoming disease, so that the patient will have his measles and presumably be immune thereafter Naturally owing to the uncertainty of the amount of antibody present in the parent's blood no exact dosage of parental serum can be stated for a particular day in the incubation period or for a particular amount of modification A review of actual results has lead to the belief that from 12 to 15 cc of parental serum given on the fourth or fifth days of the supposed incubation period will so modify the oncoming measles that the temperature may not rise above 101° F, and there will be very little catarrh, no Koplik's spots only a slight rash, no complications, and a very slight contagiousness It is still presumed that even such a slight form of the disease as this will protect a child from infection in case of future exposures to measles Little if any evidence to this effect, however, has appeared in the literature so far, and there has been at least one report of a case of measles occurring in a child who had had a case of modified measles

As to mumps, an interesting conception of the disease has recently been given by Montgomery, who believes there is primarily a blood stream infection by a filtrable virus, which has a predilection for the salivary glands, the pancreas, the mature gonads, the meninges, and the encephalon   The predilection is apparently strongest for the salivary glands, and they are nearly always involved even when there is clin ical evidence of involvement elsewhere   However, well-established cases of mumps meningo-encephalitis are on record, in which the salivary glands showed no evidence of involvement

There have been several recent developments of interest in connection with diphtheria   The use of alum precipitated diphtheria toxoid for immunization is now quite general Toxin-antitoxin formerly used contained an animal serum in very small quantities but still enough to sensitize children so that subsequent injections of an antitoxin were frequently causative of unpleasant reactions   In its preparation, diph theria toxoid is treated with formalin, completely destroying its toxicity without markedly impairing its immunizing power One and a half per cent alum is then added, precipitating the toxoid, which when injected into the tissues, because of its slow absorption, has greater immunizing power than when it is in solution   The toxoid floccules will not pass readily through a 25-gauge needle, so that a 23-gauge needle should usually be used   One dose of 1 cc suffices to immunize at least 95 per cent of children under three, but for older children and adults a preliminary dose of 0 1 cc is advisable to prevent possible more or less severe reactions

A rapid method for culturing diphtheria bacilli has recently been given some attention, whereby 95 per cent of positive cultures can be obtained by the end of four hours   Sterile cotton swabs are thoroughly soaked in undiluted, unheated horse serum, and are then lightly flamed to secure at least surface coagulation   These swabs are then used for taking the ordinary routine nose and throat cultures of the suspected case   They are placed in dry sterile tubes in an incubator

and smear preparations are examined at the end of two and four hours   The accuracy of this method exceeds that of the usual Löffler s slant method even after eighteen hours' incubation, and furthermore provides for the securing of pure cultures for toxicity tests within eighteen hours, greatly shortening the length of time usually necessary for determining the virulence of diphtheria bacilli

The nature of the various forms of infectious laryngitis, their differential diagnosis and their treatment, are much better understood than they were until recently, as the result of a more general and more skilful use of laryngoscopy in the routine examination of so-called croup cases on admission into a hospital   Much progress has been made in lowering the mortality, not only of diphtheritic laryngitis, but also of those somewhat similar infections of the larynx and trachea which are due to a streptococcus rather than to the diphtheria bacillus

So also the management of diphtheria patients with heart involvement has been helped by scientific methods of precision, the electrocardiogram now enabling the detection of toxic involvement of the heart in diphtheria, even when no other clinical evidence can be elicited   Two general types of abnormality are found   First, evidences of delayed conduction time of varying degree up to complete heart block, and second, an inversion of the T wave which, when it occurs in the first and second leads, is considered evidence of toxic involvement of the heart muscle   Diphtheria patients are kept flat on their backs until the electrocardiogram shows that the T wave is no longer inverted or of course until the conduction time is normal

Although the campaign for the elimination of diphtheria has progressed so that even as large a city as Yonkers, N. Y. has recently gone for over three years without a single death from diphtheria, nevertheless reports occasionally appear of particularly virulent types of diphtheria infections so that the impression was gained in some circles that possibly new strains of the organism existed for which there was as yet no suit

able antitoxin   However, Povitski and her coworkers have shown that the present standard toxin and antitoxin are still suitable for use in the prevention and treatment of diphtheria occurring anywhere

In whooping cough much interest has been attracted the last year or so to new vaccines made from the Bordet-Gengou bacillus, and their use in the prevention and treatment of this disease   Sauer has prepared a vaccine from strains freshly isolated from cases of the disease and grown on human blood agar, then killed and preserved with a 0 5 per cent phenolized physiologic solution of sodium chloride   This preparation is given in total dosage of 80 billion killed bacilli, and after four months has, with only two or three minor exceptions in nearly 1500 cases, given protection against an unknown number of exposures to whooping cough, a protection which it is believed lasts at least four or five years   In a number of families that were definitely exposed, 29 of the children had been inoculated while 31 of their brothers and sisters were presumably susceptible and were used as controls, all 31 contracted whooping cough, while their 29 inoculated brothers and sisters lived with them throughout the incubation, catarrhal, and paroxysmal stages without contracting the disease

Krueger has recently called attention to the possibility of physical and chemical manipulations incident to the preparation of vaccines altering the antigenicity of bacteria by denaturation reactions and to offset this denaturation factor he devised a technic for the fragmentation of living bacterial cells, and has put into solution or suspension the cellular components released by this method   Such undenatured antigens are nontoxic, free from nonspecific elements, yet contain the native antigens of the living bacterial cell in an unaltered and undenatured form   Using the Bordet-Gengou bacillus, he prepared in this manner a pertussis undenatured bacterial antigen, sometimes known as U B A , the resulting water-clear filtrate containing the material in molecular or colloidal solution, which represents approximately 10 billion bacilli per cubic centimeter   Commercial preparations of

this pertussis U B A are on the market, and while not by any means invariably beneficial, their administration has apparently given some very satisfactory results, perhaps more in the modification than in the prevention of the disease

As a result of these recent developments, it is now recommended to give the Sauer pertussis vaccine to infants shortly after they are six months of age   Four months later they can be inoculated against diphtheria, and four months later, or when fourteen months of age, they can be Schick tested and vaccinated against smallpox   Should a child who has not had the Sauer vaccine develop a tight persistent cough and pertussis is suspected, cough droplet cultures should be taken on the Bordet blood agar culture plates, and the Krueger vaccine started   In three days a preliminary report on the culture may be given, and a definite report the next day   In the preliminary or catarrhal stage of the disease, positive cultures may be obtained in 80 per cent of cases   With the positive culture giving a definite diagnosis even several days before the paroxysmal stage might reasonably be expected, daily injections of the Krueger vaccine have been followed by such mild attacks of whooping cough in a high enough proportion of the cases to warrant attributing to the inoculations an appreciable beneficial influence

Regulations for the isolation of scarlet fever have recently been modified in New York City, so that uncompheated cases are now released after twenty-one days of isolation, while cases that are complicated, as by rhinitis or otitis, are held a minimum of thirty days   It is of interest to note that it has been shown that children from four to eleven years of age are more apt to cause return cases than adults or infants   Furthermore, return cases are more apt to appear in the cold seasons, and of course are especially more apt to follow the release from isolation of those cases that were complicated by rhinitis

In chickenpox, smallpox, and vaccinia, filtrable viruses have been found in the vesicle contents, which have been seen as minute particles, usually known as elementary bodies and

in each disease agglutination of the particular elementary bodies has been obtained by the use of appropriate serum of convalescent patients

There is much new information about poliomyelitis Statistically it is now believed that for every patient who develops paralysis there are three who have invasion of the central nervous system without the development of paralysis, and 15 to 20 abortive cases with early systemic manifestations only (Paul and Trask found the ratio of abortive cases to frank cases to be about 5 to 1)

Of patients developing paralysis, about 8 per cent make a complete recovery while still in isolation, that is, during the first three weeks, and including them, 30 per cent show no paralysis at the end of a year Bulbar lesions, if not fatal, are more apt to be followed by complete recovery than spinal lesions For instance, nearly 60 per cent (58 33) of patients with facial paralysis alone are without paralysis one year later

At least one portal of entry of the virus is the nasopharynx to the olfactory bulb, whence it passes along nerve fibers through the base of the brain to the medulla and the cord Brodie believes this the only portal of entry Others have noted in patients dying very early in the disease as well as in those dying late certain constitutional manifestations, such as involvement of the reticulo-endothelial system and of the lymphoid structures of the gastro-intestinal tract which might be said to correspond to the clinical manifestations that are to be noted in the prodromal period of certain cases On this and other evidence it has been argued that the disease is at first a systemic infection, perhaps as a result of ingestion of the virus, and only later is the virus localized in the central nervous system However, neither in man nor in experimental monkeys has the virus ever been found in the viscera, the blood, or even the spinal fluid in any stage of the disease, and the cause of the so-called "constitutional pathological findings" might arise from the involvement of the central nervous system, the changes not being specific of polio

myelitis The virus has been demonstrated in washings of
the nasopharynx of patients and well carriers, in the brain
substance of monkeys during the incubation period, the later
on in the incubation period the further on toward the medulla
from the olfactory bulb, and of course in the medulla and
cord substance of monkeys and mankind dying of the dis
ease. The virus reaches the cord before the onset of symp
toms and very early in the course of the disease exerts its
action and becomes fixed in the nerve cells Nerve cell dam
age is not as severe in the medulla as in the cord

There is clear evidence that virus has a predilection for
cord tissue, even rather than brain tissue, because the latter
experimentally has an antiviral action while the cord absorbs
virus However, encephalitic forms of poliomyelitis do occur,
and 3 per cent of the poliomyelitis patients in Willard Parker
Hospital in 1933 were of this type The mortality was 75
per cent in contrast to slightly below 10 per cent for the
bulbar and spinal cases combined, of this series

Of the clinical manifestations, most have been well known
for some years, but the preparalytic stage is recognized far
more often than it was before the 1931 epidemic. In addition
to the better known manifestations of fever, headache, vomit
ing stiff painful spine muscle tenderness, hyperesthesia, and
general irritability, the frequent occurrence of a coarse tremor
in this stage should be noted

As to prognosis it may perhaps be stated that there is a
slight unfavorable difference in the prognosis if

1 The onset is sudden
2 The prostration is marked
3 The admission temperature is over 102 1
4 The spinal fluid cell count is over 250

The early appearance of a paralysis does *not* seem to in
dicate greater seriousness of outlook as regards life

Theoretically immunization is now possible by a number
of different methods A *passive* immunity lasting not more
than two to four weeks may perhaps be obtained by the ad
ministration of convalescent serum, of pooled adult sera or

of pooled placental extracts, but their efficacy is difficult to
prove, even as is the need of any particular child for such
immunization   Titrating a person's blood against the virus
in monkey experimentation has until recently been the only
method available for determining the presence or absence of
antibodies specific for this infection, but Brodie has very re
cently reported that mice can be used for similar tests instead
of monkeys, and that because of a much shorter incubation
period in mice, the testing of human blood specimens for
poliomyelitis antibodies is made much quicker and far less
expensive   However, when one child in a family has de
veloped the disease, it would probably be well for the other
children in that family to receive at once some such injection
as convalescent serum, as susceptibility to the disease some
times seeming to run in families

Two methods for developing an *active* immunity in man
have recently been descr bed—one using an attenuated virus,
the other killed virus   Kolmer treated with sodium ricinoleate
a spinal cord emulsion containing virus, ripened the product
two to four weeks in a refrigerator, and tested the product for
sterility in aerobic and anaerobic culture   The preparation
was still able to cause poliomyelitis in monkeys by intracere
bral injection, but the disease had a longer incubation period
and was less severe than normal   After monkey experimenta
tion he tried inoculating himself and his own and others' chil
dren by the subcutaneous route, and proved the development
of helpful amounts of antibody even within a week's time
His virus is attenuated, not dead, but is given subcutane-
ously safely, while if given in the nose it might be very
dangerous

Using a virus killed by formalin, Brodie has similarly in
oculated himself and a number of children, as well as monkeys,
and has also shown the rapid development of antibodies   The
virus suspension used for the preparation of his vaccine was
cultured aerobically and anaerobically before it was treated
with 0 1 per cent formalin for sixteen hours   Of a 10 per cent
suspension, he administers 1 to 2 5 cc intracutaneously (a

painful procedure) and the remainder of 5 cc. subcutaneously in the abdominal wall, and has repeated the injections after ten to fourteen days. He has showed that either one or two doses gave appreciable immunity to monkeys, the amount comparing favorably with the immunity developed by active virus or after convalescence, and much more important, that such vaccination gave an appreciable antibody response in humans. Whether or not the immunity will last more than a few months is still to be determined.

In the *treatment* of the disease the value of serum is still much debated. Many are convinced not only that there is no good evidence that any serum by any route has been of value, but that after the onset of manifestations of involvement of the central nervous system serum *can't* be of value, being unable to reach the virus which is already tied in close association with the nerve cells.

Park has called attention to the fact that in any disease when a filtrable virus is the etiological factor as in poliomyelitis, no convalescent immune serum has as yet been shown to be effectual in any but a preventive manner.

On the other hand, it is believed that complete rest from the earliest moment is vitally essential, rest of the whole individual, and should paralysis develop, rest of the affected muscles and of their opponents. The use of oxygen and glucose for toxic cases is valuable. In bulbar cases gavage is helpful in avoiding aspiration pneumonia. Bulbar cases do not do well in respirators. In fact, the respirator is not the life-saver it was at first thought. In 1931 there were nearly twice as many patients in Willard Parker Hospital who needed respirator treatment as could be provided with it. Two comparable series of cases were thus provided for study, those that were put in respirators and those that were not. Although the mortality in the two groups while in the hospital was comparable, one year later five times as many of the respirator patients had died, having proved very liable to contract pneumonia in the subsequent months after leaving the hospital.

This review but skims the surface of the recent developments in this group of diseases, but perhaps enough to show that interesting and important additions to a more accurate understanding of the common contagious diseases have taken place in the past two or three years, and still more may be expected in the not too distant future

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MANAGEMENT OF THE COLD PROBLEM IN INFANTS AND CHILDREN

AT the present time there is evidence that the etiology of
the common cold is a complex one   Briefly stated, this theory
of etiology is as follows   It is believed that the initiating
agent in outbreaks of the common cold is usually a filtrable
virus, and that this virus has the power to activate certain
bacteria often found in the respiratory tract, so that a factor
of bacterial infection is added to the factor of virus infection
It is also believed that the virus infection by itself is probably
a rather mild self limited disease and that the complications
of colds are caused by pathogenic bacteria

Now the existence of the virus has been chiefly shown in
adults but there is no reason to believe that it does not exist
in childhood for colds are readily communicable from chil
dren to adults and *vice versa* and the colds of one group
show no fundamental dissimilarity to those of the other On
the other hand the activities of the pathogenic bacteria are
more readily demonstrable in small children than in adults

Although there seems to be no fundamental dissimilarity
of mechanism in the two groups, clinical differences certainly
exist   These may be summarized as follows   (1) The ten
dency for children to have a mild degree of fever with an un
complicated cold and (2) in addition to sinusitis the much
greater incidence in childhood of infection of the middle ear

the mastoid cells, and prolonged inflammation of the cervical
lymph glands as complications of upper respiratory disease
It is obvious that the treatment of the last named complica
tions falls outside the scope of the general consideration of
the cold problem in childhood   We shall, therefore, go on
to a brief discussion of the therapy of the "uncomplicated"
cold in childhood, to be followed by a more extensive review
of the methods of prevention

Bearing in mind the features that distinguish colds in child
hood as mentioned above, certain points of general treatment
are obvious   Owing to the tendency for fever to occur in the
early stages, it is best that the child be kept in bed during this
period, and owing to the possibility of complications, it is
advisable to keep the child indoors for a day or two afterward
in winter weather   The room should be well-ventilated but
warm, the use of a small pillow under the child's head is
also advised in the hope of diminishing the likelihood of
middle-ear disease   Drug therapy is limited to the use of
catharsis, if such is indicated   Parenthetically, one may say
that it is very doubtful whether a cold can be "aborted" by
catharsis, or, for that matter, by any other measure   The
use of alkalis or sedative drugs, both popular measures in
the treatment of adults, is not to be recommended   Diet
should be simplified, and the fluid intake kept well up

In regard to local measures, three varieties of applications
come to mind   First are the local antiseptics, here one may
say that there is no theoretical or practical evidence that
"sterilization" of the mucous membrane during an acute cold
is possible   Next are the vasoconstrictor drugs which shrink
the mucous membranes and therefore promote drainage of
the paranasal sinuses   Strong solutions of these drugs are
irritating and their unrestricted employment is to be con-
demned, however, the use of ½ of 1 per cent ephedrine
alkaloid in oil for a few days is considered of value in lessen-
ing complications   Another method of dealing with thick
secretions in infants is the use of very gentle suction with a
soft rubber bulb   Lastly, there are the bland, nonirritating

nose drops, such as simple albolene, which are supposed to allay irritation   These are probably beneficial where much excoriation of the nares is present, although here again it has been argued that the use of oily substances in acute rhinitis may block the normal drainage of secretions   To sum up, then, there are no local measures of any specific value in the treatment of the uncomplicated cold

Unfortunately, the immunity conferred by an acute cold is often of short duration   Many children appear to be extremely susceptible not only to colds but to their complications, and, in fact, these diseases in many households constitute a problem of great magnitude   It seems logical therefore, to inquire into the methods of prevention as opposed to cure   Now, it is probably true that city children are more heavily afflicted with colds and their sequelae than country children   Doubtless this is largely a result of the density of population, which increases the distribution and dosage of infective material   It is the author's opinion that the modern custom of massing susceptible small children together in day nurseries, nursery schools, and kindergartens *indoors* in the winter increases the incidence of respiratory disease   Another factor that has been mentioned is the constant stirring up of dust by the tires of rapidly moving motor cars   In any case, there is a feeling that colds are more of a problem than they used to be, whatever the cause, children must live in the city, and a great deal of investigation has been made in an effort to render the highly susceptible city child less susceptible to colds

The first of the preventive measures that comes to mind is quarantine—the isolation of the infected child or adult in the home, and the removal of all infected children from school or kindergarten   This is obviously right in principle, from a practical standpoint however, real quarantine is impossible   It must be remembered that the common cold is one of the most highly communicable of all diseases, and that it is probably communicable even before the symptoms are really manifest   True isolation technic is hardly ever practicable in the home   Nevertheless, these efforts at quarantine are sound in theory,

they probably decrease to some extent the dosage of virus, and should be continued

Turning now to methods which have been recommended to render the individual child less susceptible to colds, one finds many references to the subject of nutrition   It would seem that the resistance of the well-nourished child should be higher than that of the ill-nourished   This is probably true with regard to the resistance in extreme marasmus and star vation   However, within the limits of the very well-nourished, normal, and moderately undernourished groups, it has not been possible to demonstrate any difference in susceptibility to upper respiratory disease   This, of course, should not be con strued as an argument against the practice of good nutrition, but simply as another discouraging feature of the cold problem

Intimately linked with nutrition are the vitamins, and these various entities have been studied in relation to respiratory disease   The most tempting of these is vitamin A, which was at one time actually designated as the "anti-infective" vitamin owing to the effect which it had on rats which had been sus tained on a vitamin A-free diet   It must be borne in mind, however, that a vast difference exists between the supplying of a necessary vitamin to an animal in a state of deficiency, and the use of excessive amounts of the same vitamin in indi viduals taking a normal diet   The ordinary diet of infancy and childhood is not a vitamin-deficient one, and it is not logical, therefore, to expect much benefit from the use of vitamins in excess   This indeed is the case, and controlled experiments have not yet shown that the susceptibility of chil dren to colds can be modified by the employment of large amounts of vitamins   The same may be said of ultraviolet irradiation   Here is an agent which is undoubtedly concerned in the manufacture of vitamin D, in addition it would seem to convey the mysterious therapeutic effect of tropical sun light   It is not surprising, therefore, that the sun lamp was at one time expected to endow those supine beneath it with the imperviousness to respiratory disease characteristic of tropical residents   Such, unfortunately, has not proved to be the case,

for very careful studies of the effect of Alpine light in children as well as adults have not shown it to diminish susceptibility to upper respiratory disease.

The child's clothing is an important part of his general hygiene, children are often overdressed in cold weather, and it is advisable to use a minimum amount of clothing indoors The underwear should be of silk, or silk and wool, light weight, and short   Additional warmth may be provided by a sweater indoors, and out-of-doors by coats and leggings   Furthermore, it may be added, that the attempt to condition the air of playrooms in regard to moisture, temperature, and dust, is a worthy effort in the direction of cold control

From a consideration of the foregoing data it becomes plain that we do not really understand the general and constitutional factors which underlie susceptibility to colds   That variations in susceptibility exist, however, is abundantly evident, and one is led to inquire whether there exist any specific immunological means of increasing resistance   As there is no method at present for immunizing against the virus of the common cold, what is the value of attempting to immunize against the secondary invaders?   This brings us to the subject of the so-called "cold vaccines "

At the outset it may be said that "cold vaccines" used as a routine measure in indiscriminately selected groups of children are disappointing   However if we bear in mind the importance of these secondary bacterial invaders which it is so easy to demonstrate in childhood, and also the tendency of susceptible children to have the numerous complications of the common cold, it is possible to assume that bacterial vaccines might influence, not the incidence of the common cold but its severity and complications   For this reason bacterial vaccines would be indicated not as a routine procedure but rather as a special measure to be employed only in those children who have shown an especially high susceptibility to respiratory diseases   From the data which have been collected we believe this to be the case   Experiments conducted on groups of children under continuous observation with adequate controls,

have shown that the use of such vaccines does diminish the
severity of colds and their complications, while the number
of colds is not altered

In order for such a vaccine to be effective we believe that
it should be as simple as possible, and that it should be ad
ministered over a long period of time   The average stock
vaccine contains so many different organisms, many of them
probably irrelevant, that the antigenic value of any one must
be low   Experience has led us to believe that the important
respiratory bacterial invaders in childhood are the pneumo-
cocci, H influenzae and hemolytic streptococci   We feel
that a satisfactory vaccine can be made of these three   In
regard to the pneumococcus, we do not advise the inclusion of
types I and II which are rarely encountered in infancy and
childhood, but rather types VI and XIV, which are very com
mon, together with type III, which at times gives rise to
mastoiditis   A vaccine can be made up of the organisms men-
tioned so as to contain approximately one billion organisms per
cubic centimeter   The course of injections should be com
menced fairly early in the autumn, starting with 0 1 cc. and
working up by tenths to the maximum of 1 cc   We believe it
advisable to give the injections twice weekly for two or three
weeks, and then at weekly intervals for a long period of time—
perhaps for the entire winter

A cumbersome procedure of this sort, offering only limited
benefits, is clearly indicated in special cases only—as we have
pointed out, in the small group that is highly susceptible to
respiratory disease   In this group, experience indicates that it
is of value, and constitutes, we believe, the only method of
attack on one aspect of the cold problem, although at best it
is a poor one

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DIAGNOSIS AND TREATMENT OF MENINGITIS

MENINGITIS is a relatively uncommon but extremely serious disease. It follows, therefore, that few physicians see a sufficiently large number of cases to draw accurate conclusions in regard to the various methods of treatment   In this discussion I shall devote most of the space to meningococcic meningitis   This is by far the most important form because of its greater frequency in normal times, the occurrence of epidemics, and its favorable response to adequate therapy

Tables 1 and 2 show the distribution by age and etiology of more than 3000 cases of meningitis   Table 1, common forms, Table 2, uncommon forms   A study of these tables shows the great preponderance of the meningococcic form, although there has been no real epidemic of meningitis in New York City during the time these cases have been collected   The tables also show the relative frequency of meningitis in children

Cases of meningitis due to streptococcus and pneumococcus are usually secondary to some primary focus of infection in the respiratory tract, in the ear, or in the sinuses   It is interesting to note that during the past three or four years there has been an increase in the number of cases of meningitis due to Bacillus influenzae   Of course, influenzal meningitis has no connection whatever with clinical influenza   Indeed it was noted in the epidemic of influenza in 1918 and 1919 that there was no increase in the number of cases of influenzal meningitis in New York City   As is well known, the great majority of bacteria

ologists do not regard the influenza bacillus as an etiologic
factor of clinical influenza   It is, however, the etiologic
factor of influenzal meningitis

TABLE 1

MENINGITIS—AGE AND ETIOLOGY

	Meningococcus	Pneumococcus	Streptococcus	B influenzae	Tubercle bacillus	Miscellaneous	Total
1–2–3 months	44	10	13	3	4	14	88
4–5–6 months	84	6	10	13	27	10	150
7–12 months incl	95	17	4	24	107	21	268
Total under 1 year	223	33	27	40	138	45	506
1–2 years	96	14	5	36	189	10	350
2–3 years	61	11	12	16	113	8	221
3–5 years	156	19	23	21	165	13	397
5–10 years	247	33	94	14	142	29	559
10–20 years	273	29	33	7	103	40	485
Over 20 years	291	90	39	8	123	70	621
No age stated	11	6	5		13	4	39
Total	1358	235	238	142	986	219	3178

It should be understood that a meningitis associated with a
definite focus of infection is not necessarily secondary to it.
Not infrequently we see cases of meningococcic meningitis fol-
lowing a pneumonia or otitis media which are in all probability
not due to the meningococcus   Again, a recent case of menin-
gitis caused by hemolytic streptococcus occurred during con
valescence from a pneumococcus type II pneumonia

The meningococcus is almost constantly present in the
nasopharynx of patients suffering from meningitis   This is
also the case in a certain percentage of healthy individuals,
who have had no contact with patients   It is assumed that the

disease is spread largely by carriers since there are relatively few instances of direct exposure. From the low morbidity even in epidemics, it would seem that most individuals have devel

TABLE 2

UNUSUAL TYPES OF MENINGITIS—AGE AND ETIOLOGY

	Staphylo-coccus	B. coli	Actinomyces	B. proc. angus.	Friedländer's bacillus	Torula.	Typhoid dysentery	M. catar. rhalis.	Saprothricea.	Mixed infections.	And not determined.	Total
1–3 months		5					1	1		2	5	14
4 through 6										2	8	10
7 through 12	2	1	2		1					4	11	21
Under 1 year	2	6	2		1		1	1		8	24	45
1–2 years	1							1		1	7	10
2–3 years	1			1	1						5	8
3–5 years				3						2	7	13
5–10 years	4	1	1	1						3	18	29
10–20 years	7		3			2			1	1	20	40
Over 20 years	15	1	2	2	3	1				5	41	70
No age given											4	4
Total	33	8	9	4	5	3	2	2	1	6	126	219

oped an immunity in some way. From the comparatively few records of direct exposure, the incubation period seems to be short, perhaps three to five days.

SYMPTOMATOLOGY OF MENINGOCOCCIC MENINGITIS

The symptoms of meningitis are due to various causes. They may be regarded as representing a general reaction to an acute infection and also a specific reaction due to the involvement of the meninges and central nervous system. It is sometimes difficult to decide exactly which element produces a given symptom. The action of a toxin, the increased pressure of the spinal fluid or the active inflammatory reaction in

the meninges and nerve tissue In the production of many of the symptoms doubtless one or more of these elements play a part

The symptomatology of all types of purulent meningitis is in general the same   Of course, in meningitis secondary to other infections the onset is usually masked by the symptoms of the primary infection   It will be necessary, therefore, to describe only the symptomatology of meningococcic menin gitis, and that rather briefly   The clinical picture in all is modified by the severity of the infection and the resistance of the individual   For clinical purposes, it is convenient to consider four types   (1) The usual type in older children and adults, (2) clinical picture in infants, (3) septicemic type, and (4) fulminating type

1 **The Usual Type in Older Children and Adults** — The onset is abrupt with rare exceptions   The attack is usu ally ushered in by intense headache, vomiting, fever and often chills   Vomiting occurs almost constantly early in the disease, and may be very persistent for the first twenty-four to forty-eight hours   The temperature at onset is almost invariably high, from 102° to 105° F , and ordinarily it remains elevated though with remissions, as a rule, every few hours during the course of the disease, followed by lysis if the patient improves   Rarely a case is practically afebrile throughout a long and tedious illness   The pulse is usually increased in rate though often not in proportion to the temperature   It is regular in rhythm and of good volume and tension   The brady-cardia and irregularity of the pulse that are so often encountered in tuberculous meningitis are unusual   The respiration is often of the Biot type, showing marked variation in rate and depth   In very severe cases the Cheyne-Stokes type may develop especially near the termination   Convulsions may occur, especially in young children   The patients are frequently hyperesthetic and sensitive to light   There may be pains in the back especially in the cervical region

The mental condition is subject to the widest variations In rather mild cases the mentality may be practically normal

throughout the course except for some irritability and restless
ness   In more severe cases, active delirium may develop early,
sometimes clearing up after the first dose of serum   In un
favorable cases, the delirium is usually succeeded by stupor,
progressing to coma   In other severe cases, there may be a
condition of semistupor or even coma early in the disease
The bowels are usually constipated and there is often retention
of urine. There may be loss of sphincteric control in the very
severe cases in which coma develops

Hypertonicity of certain muscles probably due to inflam
mation of the meninges over the posterior nerve roots is al
most constantly present in patients over a year old   This
shows itself in various ways, first in rigidity of the neck
which varies from a slight anteroposterior stiffness to a re
traction with almost complete fixation of the head   The
retraction may be so great that swallowing is almost im
possible   Another manifestation of this hypertonicity is opis
thotonus which often develops in serious and prolonged cases,
especially in posterior basic types   A positive Kernig sign
is a third manifestation   It is often absent or difficult to
determine in young children   To the same cause are doubt
less due the Brudzinski neck and leg signs   Paralyses are
rare but they may occur   They may be very transient
Paralysis of the eye muscles with resulting strabismus and
ptosis are the most frequent and persistent   We do not attach
much importance to Babinski and confirmatory signs unless
there is a hemiplegia   Tremor of the coarse intention type
occasionally occurs   Early in the disease the tendon reflexes
are apt to be exaggerated and equal, later they may become
unequal, diminished and finally lost   The reaction of the pupils
to light follows the same course   Ophthalmoscopic examina
tion often shows moderate congestion of the disk   Rarely
there is an optic neuritis with or without choking of the disk
In children a positive Macewen sign indicating increased intra
ventricular pressure can usually be detected   An herpetic
eruption is frequently present   It most often occurs along the
mucous membrane of the lips or in a more unusual location

upon the ball of the foot or along the course of one of the
nerves   It usually appears on the third to the seventh day
and has no prognostic significance   An hemorrhagic eruption
occurs in 12 to 15 per cent of the sporadic cases   The spots
vary in size from petechiae to enormous blotches   This rash
appears early (within the first thirty-six hours) and usually
fades in two or three days   It must not be forgotten that a
hemorrhagic rash may occur in other forms of meningitis with
septicemia and is, therefore, not pathognomonic of meningo-
coccic infection   We have seen cases of influenzal, staphylo-
coccic and streptococcic meningitis with an hemorrhagic
eruption   This early hemorrhagic rash, which is speedily fol
lowed by meningeal symptoms, is due, we believe, to transient
invasion of the blood stream by the meningococcus or possibly
to the reaction of toxins   In a series of 43 early cases, 21 of
whom had a hemorrhagic rash at the time blood culture was
taken, there was a positive culture in only three instances
This hemorrhagic rash does not by any means necessarily
indicate that the disease is of the septicemic type

The course of the disease, in the treated case, depends on
how early the serum in administered and the response of the
patient to the treatment   There are four courses which the
disease may pursue   (a) It may run an acute course, the
patient either dying or recovering after a few doses of serum,
(b) the disease may be greatly prolonged so that 20 or more
doses of serum may be given before death or recovery finally
takes place, (c) the disease may relapse after apparent re
covery, indicating perhaps that some focal or walled-off infec-
tion has broken down, a type of case in which recovery not
infrequently takes place, (d) there is a course in which there
is blocking due to the formation of adhesions and these may
be either along the spinal canal or at the base of the brain

2 Clinical Picture in Infants —It has been shown in
Table 1 that more cases occur in the first year of life than in
any other one year   It is at this age that mortality is highest
and diagnosis most difficult   In infants we do not see early
stiffness of the neck, the Kernig sign or the changes in reflexes

that characterize the disease in older children and adults
The onset is less sudden There is often vomiting and practic
ally always some intestinal disturbance, especially the presence
of greenish, slimy stools There is an irregular fever The
gastro-intestinal condition does not respond to the usual
method of treatment Convulsions may occur early, but these
are so common in other diseases of infants that they are not
diagnostic.

Usually ten days or two weeks have elapsed before symp-
toms develop that direct the physician's attention to the central
nervous system These may be the development of strabismus,
a fairly well-defined rigidity of the neck, or severe convulsions
Much earlier a bulging of the fontanel may have been detected
if an examination of the child had been made when he was not
crying The presence or absence of a bulging fontanel is an
almost invariable indication of the state of pressure of the
spinal fluid It is not absolutely reliable because on several
occasions a lumbar puncture has revealed increased pressure
although the fontanel did not bulge

The pupillary and patellar reflexes are often normal until
the case is well advanced Certainly an irregular fever and a
gastro-enteritis that does not respond readily to treatment,
especially when there is a bulging fontanel, are sufficient indi
cations for early lumbar puncture

It is in these young children that a walling off of the base
with resultant dry tap most frequently occurs

3 Septicemic Type —This type of meningitis is quite
rare among sporadic cases, but in certain of the army camps
during the war and in the more recent epidemics of the West
there was a large percentage of this type of case The early
picture is that of a septicemia rather than that of a menin
gitis, the meningeal symptoms developing five or six days or
more after the onset

A profuse and rapidly spreading, maculopapular or purpuric
rash is an almost constant feature Often the rash is poly
morphous presenting a combination of erythematous and hem
orrhagic spots The eruption usually persists for some time

Other indications of a generalized blood infection such as joint involvement may be present even before the meningeal symptoms Of course, the blood culture is positive

4 **Fulminating Type**—This type is rare except in epidemics It is characterized by a violent onset The patient is usually seized with severe headache and vomiting and speedily loses consciousness There is an overwhelming septicemia The course is very brief, death occurring within from twenty four to forty-eight hours, or even less There are cases on record in which the patient retired in apparently good health and was found dead in the morning The importance of this from a medicolegal standpoint must be borne in mind

TUBERCULOUS MENINGITIS

The symptoms of tuberculous meningitis are too familiar to require much discussion Before epidemic encephalitis appeared, most of us felt fairly confident in making a diagnosis Now we realize that it must be confirmed by the spinal fluid examination It is worth pointing out that the onset is not always gradual It may be quite abrupt, suggesting a purulent meningitis There may be paralysis, suggesting poliomyelitis One of our patients had a psychosis at the onset, another persistent hiccough

EXAMINATIONS OF THE SPINAL FLUID

The principal points to be considered in the examination of the spinal fluid are these Appearance and amount, cytology, bacteriology by smear and particularly by culture, the protein and sugar content, the Wassermann, and animal inoculation if indicated

In meningitis the bacteriological is by far the most important part of this examination, and one that is unfortunately not sufficiently stressed The smears from the centrifuged sediment should be stained by the Ziehl-Neelsen method if the fluid is clear, by the Gram method if it is cloudy, and by both methods in hazy fluids if no organisms are shown by the Gram method

It has been our experience that the stained smear alone is unreliable in the diagnosis of purulent meningitis The organisms are often very pleomorphic and while gram negative organisms are always gram negative, in many instances gram positive ones will show as gram amphophilic or even as completely decolorized forms It is only when the organism has been identified by culture that a definite diagnosis can be made The centrifuged sediment should be planted on a variety of mediums for early identification and an anaerobic culture should always be made   All organisms isolated should be studied until they are thoroughly identified Cultures should not be discarded as negative until they have been incubated for a period of two weeks or more

A few points should be considered in regard to the fluids in the different types of meningitis

Spinal Fluid in Tuberculous Meningitis —In tuberculous meningitis, the fluid is usually fairly clear, rarely slightly cloudy, a web almost constantly forms when the fluid is allowed to stand   The cell count varies from a moderate increase above normal to several hundred cells, the cells usually showing a preponderance of mononuclears except in the slightly cloudy fluids when the polymorphonuclears predominate   By careful technic, the tubercle bacilli can be demonstrated in the smear in more than 90 per cent of cases It has recently been shown that the tubercle bacilli grow rather readily on Bordet medium, the culture appearing in three to four weeks The cultures have sometimes grown when no organisms could be demonstrated in the smear This culture method has certain advantages over inoculation of the fluid in guinea pig The protein in tuberculous meningitis is increased in varying degree   The sugar content is usually normal early, but as the disease progresses it ordinarily becomes greatly diminished In a few rare instances, it has remained normal almost to the end of the illness

Spinal Fluid in Purulent Meningitis —In purulent meningitis, the fluid may vary in appearance from slight haziness to a thick purulent exudate   The cell count is not par

ticularly reliable for two reasons   The cells settle out quickly
and it is almost impossible to obtain uniform distribution.
Again, the first and last portions of the fluid obtained at a
lumbar puncture may vary very greatly in cytology   For
these two reasons it is almost impossible to obtain a really
accurate cell count

The importance of the bacteriologic study in purulent
meningitis has already been emphasized   The protein content
is increased in varying degree   The sugar content may be
normal early in the disease but it is usually decreased later,
returning again to normal if the patient responds to treat
ment   The return to normal of the sugar content of the spinal
fluid we regard as second in importance only to the disappear
ance of the organisms   We think the study of the sugar con
tent in spinal fluids is of much more diagnostic importance
than the chlorides   It is essential to make a daily complete
study of all spinal fluids   This study is an important indica
tion of the course of the disease and the efficacy of treatment
Not infrequently a drop in the sugar content has forecast an
exacerbation, even before organisms reappeared   This daily
study of the fluids also rules out the possibility of missing the
development of a mixed infection

OTHER LABORATORY STUDIES

Repeated blood cultures are indicated in all forms of puru
lent meningitis   In meningococcic meningitis invasion of the
blood, if it occurs, is usually transient except in the septicemic
type   In other forms of purulent meningitis, there may be a
bacteremia preceding, simultaneous with, or following the de
velopment of meningitis   The presence of bacteremia modifies
the method of treatment and increases the gravity of the prog
nosis   Frequent blood counts are also of value in following the
course of the disease

TREATMENT OF MENINGOCOCCIC MENINGITIS

Serum Therapy —It is obviously impossible to lay down
any definite rule for the treatment of meningococcic menin

gitis, since it shows such wide variations in its severity in different outbreaks and in individual patients

In New York in more than thirty years there has been no real epidemic of meningitis and we have, therefore, seen a relatively small number of the severe fulminating type which has characterized epidemics elsewhere   However, many of our patients have been desperately ill

No doubt much of the confusion in regard to methods of treatment is due to the fact that there is no reliable laboratory test for the therapeutic efficacy of the serum   Hence serum of very little therapeutic value has sometimes been used When good serum is used only moderate amounts are necessary for successful results   If the serum is poor, the largest possible amounts will not be of benefit

The exact way in which the serum works cannot be definitely stated   It is not bactericidal   The agglutination titer certainly against freshly isolated organisms is not reliable Moreover in a small group of convalescents, the serums did not show agglutinins even against their homologous strains   From a study of successive fluids in cases responding to treatment it would seem to work by increasing phagocytosis   The clinical picture of certain patients suggests the presence of toxemia It is interesting, therefore, to consider the recent work of Ferry along the line of meningococcic toxin and the production of a meningococcic antitoxin   This may well prove to be an important development in the treatment of meningococcus meningitis

While we recognize that every case must be treated according to its individual need we believe that, in general a conservative method of treatment is best   We have studied the results in hospitals where more intensive methods of treatment have been employed and the comparison of their results with ours has justified this conclusion   It is our policy to use serum only intraspinally except in the septicemic type of case Our method of treatment is usually as follows   Whenever a lumbar puncture yields a cloudy or hazy fluid intrameningococcic serum warmed to body temperature is immediately

administered by gravity Further serum treatment will depend on the cultural examination of the fluid, but all cases of purulent meningitis are treated as being of the meningococcic type until they are proved to be caused by some other organism

The intraspinal administrations of serum are continued about every twenty-four hours until at least two successive specimens of fluid show no organisms by smear or culture The dose of serum is usually 20 cc if as much or more fluid has been withdrawn If the amount of fluid withdrawn is large and the serum runs in easily by gravity, without untoward symptoms on the part of the patient, 30 to 40 cc of serum may sometimes be administered at a time On the other hand, in certain instances when only a small quantity of fluid is obtained we may inject more than the amount of fluid withdrawn providing the serum runs in easily and no unfavorable symptoms result

It is desirable to drain the subarachnoid space as completely as possible before injecting serum, but if the fluid is under greatly increased pressure care must be taken to withdraw fluid slowly Using this precaution, 50 to 60 cc or more of fluid may be safely withdrawn

In certain cases with excruciating headache, especially with any indication of papilledema, it is advisable to give by hypodermic from 3 to 7½ grains of caffeine preceding the spinal tap This will reduce the extreme intracranial pressure (as shown by Foster Kennedy and his collaborators) and tend to prevent possible herniation of the cerebellum with compression of the medulla The danger of this fatal event is not great except in the occasional case that develops early and acute hydrocephalus either from edema or from plastic exudate over the foramina Luschka or in the aqueduct of Sylvius

Almost the only condition under which we inject serum is oftener than once in twenty-four hours is when the fluid is under so greatly increased pressure that a puncture at more frequent intervals seems needed to relieve it This condition rarely occurs

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Some physicians have recommended graduated doses of serum for young children, depending rather arbitrarily on the age. We have not found this necessary. We depend rather on the amount of fluid withdrawn, and the ease with which the fluid runs in by gravity in determining the size of the dose. However, it is necessary to exercise more than ordinary care in removing fluid and injecting serum in young patients.

A case of average severity will require from perhaps six to eight doses, but cases are occasionally seen where twenty or more doses of serum are necessary before the fluid becomes sterile. As has been stated, the serum treatment is continued until two successive fluids are free from organisms. This is by far the most important indication for stopping treatment. Another indication of less value is the return to normal of the spinal fluid sugar. The cell count of the spinal fluid is, by itself, of comparatively little value since, as has been stated, the cell counts are inaccurate and since the prognosis is poor when the spinal fluid becomes clearer and the organisms persist.

It is often necessary to do several lumbar punctures during convalescence for the relief of pressure and these fluids should be carefully examined and cultured, as the return of organisms would indicate additional serum treatment.

If the symptoms do not improve after the fluid becomes sterile and serum has been temporarily discontinued, it is well to resume injection of serum as the symptoms may be due to a localized meningitis with adhesions which may be favorably influenced by the continued use of serum.

If signs of blocking should develop recourse should be made to ventricular or cisternal punctures and the administration of serum by these routes. In babies, while the fontanel is still open, ventricular puncture is to be preferred to cisternal as it is less dangerous to the patient and more certain of success, since the block is quite as likely to be above the cistern as below it. We do not ordinarily resort to these methods unless there is a block. If cisternal puncture were as safe as lumbar puncture it would no doubt be advisable to

administer serum by that route However, in the hands of skilled operators death has occasionally followed cisternal punctures in meningitis, usually due to hemorrhage It seems unfortunate that these fatalities are not reported as we not infrequently read accounts of large series of cases without accident written by physicians using this technic in patients with syphilis of the central nervous system The dangers are much greater when there is an active inflammatory process with layers of adhesions and congestion of the vessels in the neighborhood of the cistern, as is likely to be the case in meningitis Cisternal puncture should be attempted only by those who have had adequate practice on the cadaver It is important, after doing two or three ventricular or cisternal punctures, again to attempt lumbar punctures In this way, one can determine whether or not the block has been relieved

In the septicemic type of meningitis serum is given also intravenously in rather large doses (50 to 100 cc daily, diluted by an equal amount of saline) This treatment is continued until the blood stream infection is under control If, for any reason, the serum cannot be given intravenously in the septicemic type of meningitis, it may be given intramuscularly although the effect is not likely to be so satisfactory In cases of meningococcemia without meningitis the serum is given only intravenously, and these cases not infrequently recover without the development of meningitis

We are very firmly convinced that it is not desirable to give serum other than intraspinally unless a real septicemia is present The intravenous administration of serum is not without danger as a severe or even fatal reaction occasionally follows Then, too, horse serum is a foreign protein that must be eliminated and that usually shows definite evidence of being more or less toxic We are quite convinced that the large quantity of serum that is given when the patient is intensively treated is actually harmful So, also, is the too frequent disturbance of the patient This applies both to the administration of large quantities of serum intravenously or intramuscu-

larly, as well as to the method followed by some of giving the patient serum intraspinally two, three or even four times a day A patient suffering from meningitis is critically ill and we must remember to treat the patient as well as the disease

When patients do not respond favorably to several doses serum, it is advisable to try a different serum   For some time we have been experimenting with various types of antibody preparations, often with successful results   In the instance of some patients who have become chronic, and in a few who have reacted unfavorably to serum, we have used an autogenous vaccine both subcutaneously and intraspinally   We have on record a number of patients who have responded favorably to vaccine therapy after becoming refractory to serum

General Treatment —The general treatment of meningococcic meningitis is very much the same as that of any other severe acute infectious disease   The patient should be kept absolutely quiet, restlessness and sleeplessness, if present, must be overcome by adequate sedatives   Morphine hypodermically should be avoided on account of its tendency to raise intracranial pressure (Kennedy and collaborators)   Vomiting and headache are usually relieved when lumbar punctures are begun   The nutrition of the patient must be supported by adequate nourishment, preferably by small amounts at frequent intervals   If retention of urine occurs catheterization will be necessary   The obstinate constipation that is usually present may be combated by mild laxatives as milk of magnesia by mouth supplemented by enemas or high colonics

The Treatment of Complications —A purulent arthritis may develop particularly in the septicemic type of the disease This usually subsides with conservative treatment but in rare instances it may be necessary to aspirate the fluid and inject antimeningococcus serum   The eyes should be examined daily so that the early development of hypopyon, which usually indicates a beginning panophthalmitis, may be detected   If this occurs, the pupil must be dilated by atropine and hot compresses applied to the eye   Usually however, the development of panophthalmitis cannot be checked

Other complications may develop for which little can be done   Among these are brain abscess, deafness, endocarditis, pericarditis, and other focal infections by the meningococcus Meningeal hemorrhage may develop in the course of meningitis and is usually, but not invariably, fatal   Repeated lumbar punctures constitute the only treatment for this condition

Serum Reaction —There are three types of serum reaction that may occur   One is the very severe reaction resembling anaphylaxis that takes place immediately after the serum is given   This is treated by adrenalin, given in the heart muscle if necessary, and by artificial respiration carried out in various ways   Fortunately, this type of reaction is most unusual following the intraspinal administration of serum

Secondly, there is reaction to the intraspinal injection of the serum which consists in restlessness, headache, and rise in temperature, developing two to four hours after the serum is given and lasting four or five hours   This varies very much in different individuals   It is treated by sedatives and ice caps to the head

Thirdly, there is the ordinary serum sickness which comes on usually in ten to fourteen days after the first dose of serum In some patients who are, for some reason, susceptible to serum, this may develop within a few hours after the serum is given   It is generally characterized by an urticarial eruption, often by some rise in temperature, and sometimes by an increase in the signs of meningeal irritation   It is occasionally difficult to decide, without a lumbar puncture, whether the patient is suffering from serum sickness alone or from serum sickness plus an exacerbation of the meningitis   If there is real doubt on this point, a lumbar puncture must be done   In some instances, there is swelling of the joints with resulting pain on movement as a manifestation of serum sickness

Serum sickness responds, as a rule, to injections of adrenalin and to suitable local applications   The presence of this form of serum sickness is not a contraindication to the administration of serum intraspinally, if that is still indicated

TREATMENT OF OTHER FORMS OF PURULENT MENINGITIS

The case fatality in all other forms of meningitis is extremely high but the outlook is not entirely hopeless and every rational method of treatment should be used If the case is secondary to a primary focus of infection this must be thoroughly eradicated if possible Indeed, it may be eradicated before bacterial meningitis develops, as the presence of a serous meningitis or meningitis sympathica often gives adequate warning of the impending danger By serous meningitis or meningitis sympathica we mean that condition which develops when there is a focus of inflammation near the meninges but not actually involving them Under these conditions, the patient presents the clinical picture of meningitis The spinal fluid is more or less hazy or cloudy with a cell count which may run up to several thousands The cells show, as a rule, a predominance of polymorphonuclears, the protein is somewhat increased, but the spinal fluid sugar is normal, and there are no organisms by smear or culture If the focus of infection is eradicated or if it subsides, under suitable treatment, the patient will recover Unfortunately, however, the serous meningitis is often a precursor of a bacterial meningitis When the bacterial meningitis has developed repeated subarachnoid drainage is definitely indicated, supplemented by the injection of specific serum if it is available If there is a bacteremia, the intravenous administration of the serum is also indicated We do not believe that chemicals or dyes are of value with the possible exception of optochin or numoquin hydrochloride in pneumococcic infections The intracarotid injection of chemicals and serums we regard as of no advantage and also as dangerous because thrombosis of the cerebral vessels may result.

Forced spinal drainage has been advocated of late This consists in the intravenous injection of hypotonic salt solution (about half normal), a lumbar puncture being performed at the same time A liter or more of the hypotonic solution is slowly injected intravenously with a resulting increase in the flow of the spinal fluid, providing that there is no tendency to blocking If the flow of the spinal fluid is not definitely in

creased after 200 or 300 cc of the hypotonic saline has been injected, the process should be stopped, otherwise the pressure of the spinal fluid will be dangerously increased   We have tried this procedure in a fairly large number of cases without particularly encouraging results   Under the right conditions, however, it may be of value, but every precaution should be taken to ascertain that there is no blocking before it is begun, and no time is to be lost in stopping the treatment if the flow of the spinal fluid is not increased

In cases of staphylococcic or Bacillus coli meningitis a bacteriophage should be tried intraspinally

Influenzal Meningitis —Influenzal meningitis deserves some special comment   It seems to be more often primary than secondary and it usually runs a rather subacute course   Both these factors are favorable as regards treatment   About 50 per cent of the strains isolated from the spinal fluid fall into one group and serums have been prepared in various laboratories, including our own   There is often temporary improvement following the use of the serum, but recovery occurs rather infrequently   It is possible that this serum can be improved by methods of increasing the antitoxic content   A study of the pathologic conditions at necropsy shows evi dence of a diffuse toxemia in the toxic degeneration of many of the viscera   The serum, therefore, should be administered intravenously as well as intraspinally   Moreover, bacteremia is quite commonly present

We have had a fair number of recoveries from various types of meningitis other than the meningococcus   Different methods of therapy have been employed but we have not felt sure of the value of many of them except repeated subarach noid drainage   There is one exception to this statement   Two cases of hemolytic streptococcic meningitis following scarlet fever recovered after the use of the antiscarlatinal serum   Both of these patiens were critically ill and it seems reasonable to suppose that the serum exercised a specific action   It may well be that recoveries are often due to the fact that the infecting organisms are of lower virulence rather than to the

type of treatment used   It is possible that something in the way of prophylaxis might be done in streptococcic and pneumococcic meningitis   If the common cold were not so often neglected and if infections of the ears and sinuses were treated early and adequately the incidence of these forms of meningitis might be lowered

Recoveries that we have had in cases seen in New York City in the past twenty five years are as follows

From streptococcic meningitis	12
From influenzal meningitis	5
From meningitis due to Friedländer's bacillus	1
From staphylococcic meningitis	1
From unidentified diphtheroid bacillus	1
From meningitis due to Bacillus evanidus (a spore bearing gram negative bacillus)	1
From mixed infections Hemolytic streptococcic and meningococcic	1
From mixed infections Staphylococcic and meningococcic	1
From unidentified gram negative bacillus and meningococcus	1

SUMMARY

The spectacular response of desperately ill patients suffering from meningococcic meningitis to adequate treatment provides one of the most gratifying returns in medicine   Fortunately most patients make an absolutely perfect recovery

The treatment of other forms of purulent meningitis is highly unsatisfactory and should be a challenge to further research

In conclusion, I wish to express my appreciation to my colleagues, Dr Henry W Jackson, Dr Imanuel Appelbaum, and Miss Ruth Gosling, to whose fine work the Division of Applied Therapy owes so much

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FEVER TREATMENT OF CHOREA

THE topic for discussion this morning is the fever treatment of chorea, but before going to the details of the treatment, I will show you this little girl who is now having her first attack Perhaps next week I will be able to show her to you as a satisfactorily treated case Up to three weeks ago Gloria was a healthy, happy child, who had had no major illnesses of any sort. An older brother had chorea when he was about nine years old, and again at eleven years, and her sister has rheumatic heart disease—in other words, she belongs to a rheumatic family

Gloria is now ten, she is in the fifth grade at school and likes her work She is ambitious, and wants to get good marks she probably worries a bit when examination time approaches As a matter of fact during examination week in February her mother noticed that she was becoming irritable and was losing her usual happy relations with other members of the family She cried rather easily and lost her appetite She soon developed a few extraneous movements of the extremities, which gradually became so marked that they interfered with normal activities such as dressing herself and eating She fumbled awkwardly with buttons and was apt to spill her food or utensils She began to make faces so that other children made fun of her At this point about two weeks after the personality changes were first noted, the mother realized that the child was ill and brought her to the clinic She has been under observation for five days, and the disease

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has continued to progress   You have noticed how her arms and legs have been moving since she has been in this room As I request her to raise her arms before her and spread the fingers, you observe with what difficulty she does this, how she is unable to keep her arms in this position for more than a moment, and how she is emotionally upset at being unable to follow my simple request   When I ask her questions you see how difficult it is for her to formulate the words in answer and grimaces during the effort, how, in fact, it is impossible to understand what she says   She is unable to grip my hand in hers, and the attempt brings out marked bizarre movements of the whole body   Gloria is a typical picture of a child in a moderately severe attack of chorea, which has progressed steadily since its beginning, and which may very well go on, if left untreated to the really severe type where any voluntary movement is impossible, and she would be unable to chew, to sit up in bed, or to make known in any way her needs or desires

QUESTION —You said that Gloria belonged to a rheumatic family   Did you mean to imply that chorea is always a rheumatic manifestation?

ANSWER —Many cases are quite clearly rheumatic, but the evidence in favor of this assumption is chiefly circumstantial By that I mean that an attack of chorea fairly often follows an attack of acute polyarthritis, that a child who has had several attacks of chorea may eventually develop rheumatic heart disease, or a child with an active attack of chorea may at the same time have evidence of acute carditis   Until we know the exact etiology of rheumatic fever, however, we cannot prove a definite relationship

QUESTION —Is chorea an infectious disease?

ANSWER —It is assumed to be, although an uncomplicated case of chorea shows none of the evidences on which we rely to prove infection, that is, there is no fever, no change in the white blood count, no increase in the sedimentation rate   It is difficult to conceive of a disease which is such a clear-cut clinical entity not having as its basis an actual anatomical

lesion, and although pathological studies do not always show it, we consider the lesion to be an encephalitis. A case like Gloria offers no difficulty in diagnosis, and I hope the picture will be so clear in your minds that you will not make the diagnosis of chorea when some other condition is present. Occasionally choreiform movements are found in basal ganglion lesions of congenital origin, and also following epidemic encephalitis. The movements in these two conditions are indistinguishable from those of Sydenham's chorea, so that the differential diagnosis is made by the history. The movements which we call "tics" or "habit spasms" are quite different in nature, the same movements are repeated over and over again, are controllable by the patient, and disappear when he concentrates. The movements of chorea are never twice alike, are uncontrollable, cannot be imitated, and are accentuated by concentrated effort of any kind.

I have shown you this child, and brought out these differential points because the diagnosis must be made correctly if good results are to be obtained from the treatment.

QUESTION.—If you consider chorea to be an infection, why did you stress the fact that Gloria's attack started during examination week at school?

ANSWER.—You may know that chorea was formerly considered a purely functional nervous disorder, until its close clinical association with the different phases of rheumatic infection was realized. It is true that an attack of chorea often seems to be irritated by some emotion such as fright or worry. Nearly 15 per cent of our cases give a history of a sudden onset following an episode such as being hit by an automobile, and by a death in the family. In one case the attack came on after the child was frightened by the father going after the mother with a knife. Many more attacks start when the child is worrying about her studies. I have seen children who have had repeated attacks of chorea, which could have been explained on a psychological basis, eventually develop heart disease. More than once I have thought that if chorea is ever psychological in origin, this is the time only to see other rheu

matic evidence appear later   One such patient had yearly
attacks of chorea, with no other rheumatic manifestation, be
ginning at the age of six, at twelve she had acute carditis
Not all children with chorea develop heart disease, but you
should remember that patients who have never had any clinical
evidence of carditis may at autopsy be found to have rheu
matic endocarditis or myocarditis   One can hypothecate in
this way   An individual by virtue of constitution is rheumatic,
the brain's resistance is lowered by sudden severe emotion,
and the rheumatic infection, not previously manifest, attacks
the body at what is at the time its weakest point, the brain,
and chorea ensues   This is pure guess work, and is perhaps a
somewhat feeble attempt to explain the rather high associa
tion of psychological factors with the initiation of attacks of
a disease which, even in the absence of any kind of definite
proof, we think must be an infection

We come now to the treatment of chorea by means of fever
This boy you see sitting here quietly and happily presented
a picture ten days ago almost identical with Gloria   Before
treatment was begun he was thoroughly studied for evidence of
active carditis, but he showed nothing to indicate that this was
present   The Mantoux test was positive, as might be expected
in a child of this age, but the x-ray of his lungs was normal
Although the presence of active tuberculosis has always been
considered a contraindication to fever therapy, a recent report
suggests that fever may be beneficial in this disease   Until
it has been definitely shown that fever either is helpful or does
no harm in tuberculosis, we think it is wiser to exclude its
presence before starting fever therapy

Just ten days ago George was given his first fever treat-
ment   New York City Board of Health typhoid-paratyphoid
vaccine was given, and he received 0 1 cc intravenously   Each
cubic centimeter of this preparation contains 1,000,000,000
typhoid bacilli, and 750,000,000 each of paratyphoid A and B,
so that in numbers of organisms he received a large dose   We
have found a smaller dose gives a good febrile reaction in only
about half the cases   After a severe chill and vomiting his

temperature rose rapidly to 105 8° F, and remained above
105° F for about one and one-half hours Until the tempera-
ture had started to fall he was quite pale and cyanotic, and was
a miserable little boy Also, the choreiform movements be-
came much more marked, so that the blankets could only be
kept on him by pinning them together He was allowed only
small sips of water, and this added to his discomfort. The
headache, which is usually severe during foreign protein shock
was controlled by the hypodermic injections of ½ grain of
codeine When the temperature had fallen to 103° F the
blankets were removed The reaction was all over and the
temperature normal six hours after the injection was given,
and since he received it at about 9 o'clock he was comfortable
and ready to eat his supper when the time came He had had
only fruit juice for breakfast in order to reduce the amount of
vomiting, and had had no dinner, so his appetite for supper was
excellent. The next day he was not exhausted from the pre-
vious day's experience, so another injection was given of 0 15
cc. The same type of reaction followed, and the temperature
reached 105 5 F Definite decrease in the choreiform move-
ments was noticeable the next day and his speech was under-
standable The dose that day was 0 25 cc. and this time the
chill was less severe, there was no vomiting and there was no
cyanosis, and the temperature reached 104 4° F The fourth
day with a dose of 0 5 cc., the temperature went up again
to 105° F, a satisfactory reaction He had four more treat-
ments, a total of eight on consecutive days The dose was
approximately doubled each day, and the febrile response was
always good After the third day of treatment the improve-
ment in the chorea was marked and after the eighth dose, there
was no sign whatever of chorea He was rather worn out
from the course of treatment but you can see for yourselves
that he i gaining back his strength rapidly Every patient
does not respond in the same way as this boy did, but the
majority do Each individual reacts a little differently to the
vaccine, some get high fever with small doses, others do not
When it is evident that the dose given is not going to give the

desired temperature, that is, at least 105° F , a second dose
can be given   I can demonstrate this best with slides   The

S.B ♂ 12 YRS.   MILD CHOREA   18 DAYS

TTV	0 1 CC	0 1 CC	0 2 CC	0 35 CC	
CHOREA	++	+	V SL	0	0
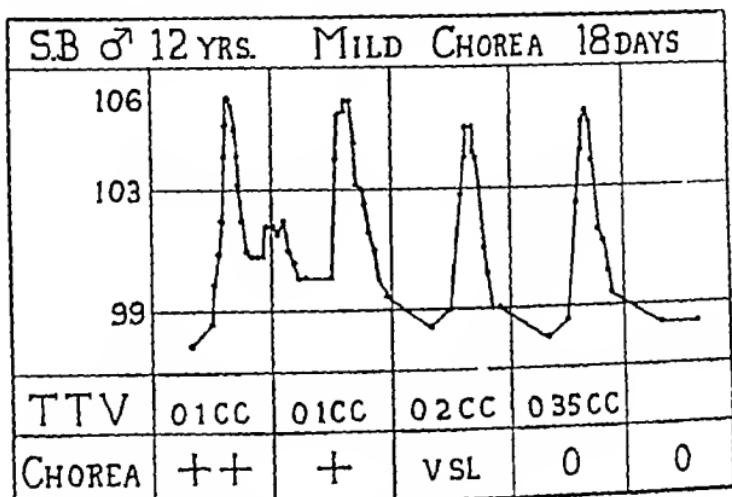
Fig 95 —Case S B   Mild chorea—first attack   Shows   First, good
temperature reactions with small doses of vaccine, second, secondary rise on
first day of treatment, which occurs in about 50 per cent of the cases, third,
good response to short course of treatment   (Jour of Ped , C V Mosby Co)

REGINA B 10YRS   MILD CHOREA   2 ND ATTACK
TREATED WITH TTV 10 MOS PREVIOUSLY

TTV	0 1 CC	0 2 CC	0 35 CC 0 15 CC	0 6 CC 0 3 CC	0 8 CC 0 2 CC	1 0 CC
CHOREA	++	+	SL	SL	VSL	VSL
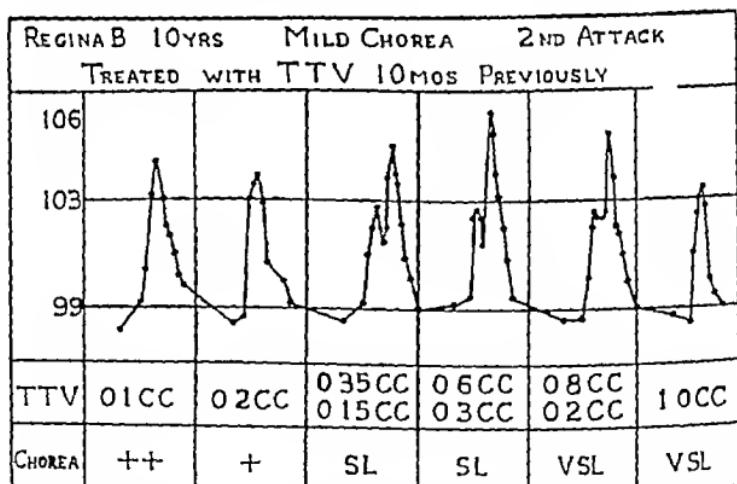
Fig 96 —Case R B   Mild chorea—second attack   First attack treated
with T T V ten months previously   Shows   First, relatively larger doses
of vaccine necessary, second, second doses on same day, third, longer course
necessary in a second attack   (Jour of Ped , C V Mosby Co)

first (Fig 95) shows a mild case with good response to small
doses of vaccine, and a prompt clearing of the chorea   The
second (Fig 96) is the temperature obtained in a child who

had previously been treated by the same means   In general,
it is less easy to get a good fever from the usual amounts of
vaccine in one who has previously had the treatment, and oc-
casionally the same is true in one who has never been treated
before   In this second slide you see that on the third day the
temperature did not reach 103° F from the first dose   After
the temperature had started to fall a second dose of a little
less than half of the first was given and good fever ensued
The same happened on the fourth and fifth days, while the
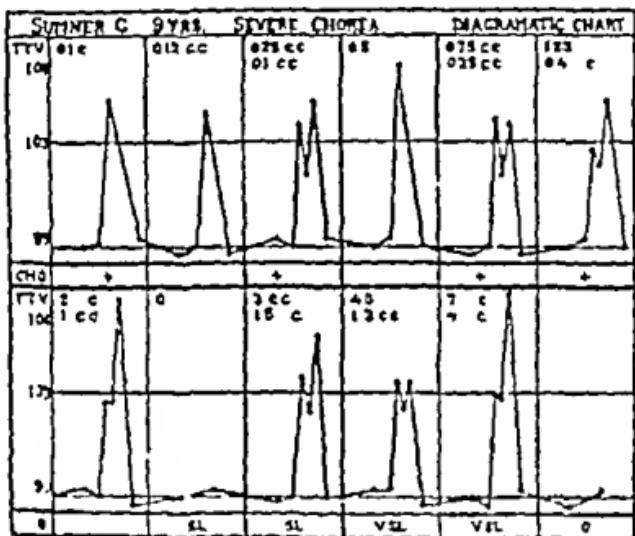
Fig 9 —Case C a Severe chorea of two weeks duration   (Case treated
at The Nursery and Child s Hospital courtesy of Dr Louis Schroeder)
Shows First severe chorea responding readily to vigorous treatment second
temperature reactions third large doses of vaccine necessary   (Jour of Ped.,
C V Mosby Co)

last reaction was really a failure as far as the production of
fever went   However, since this was a mild attack, it yielded
readily   The next slide (Fig 97) shows how in some in-
stances very large doses are needed to get good reactions
This boy received the largest amount we have used in any one
day at his last treatment   The therapeutic results in this case
were very striking   The next slide (Fig 98) shows how an-
other case turned from a severe attack of chorea to a mild one
Treatment was interrupted for a day on three occasions to

give the child a rest   You can see that not all of the reactions
were satisfactory   When the chorea was very slight the treat-
ment was stopped for three days, followed by slight but defi
nite increase in the chorea, in other words, treatment had
been stopped too soon   Three more treatments, only one of
which was really good, served to check the attack entirely
The important thing to remember in giving this treatment is
that the object is to produce fever, and that the vaccine is
only the means to the end   An outline of the exact dosage
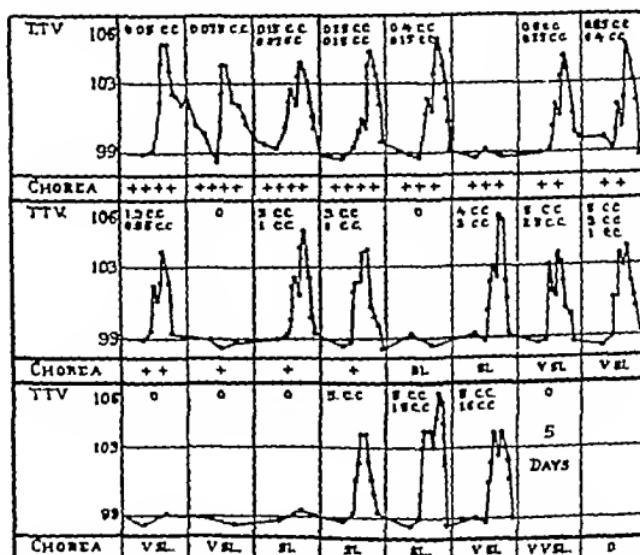
Fig 98 —Case S R   Severe chorea of one month's duration   Shows
First, case difficult to cure, requiring long course of treatment, second, rela
tively poor temperature reactions, third, relapse of chorea on rest after
thirteen treatments   (Jour of Ped , C V Mosby Co)

to do this cannot be given, since individuals react differently
to the vaccine   The dose on any one given day, after the first
one, depends on how the patient has reacted to the previous
one

QUESTION —Do all patients show as marked improvement
as the ones you have demonstrated?

ANSWER —About 10 per cent can be called difficult, that
is, either they are slower than the average in clearing up, or it
is hard to get good febrile reactions   In our experience at
Bellevue the most striking results are obtained in the cases

treated early in their first attack, although Kapper and Bauer felt that the treatment had proved of most value in the long
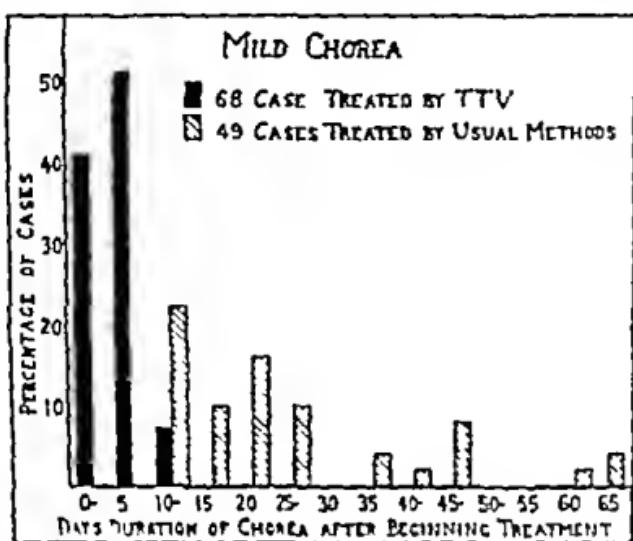
Fig. 99—Duration of the chorea after beginning of treatment in 117 mild cases. (Jour. of Ped., C. V. Mosby Co.)
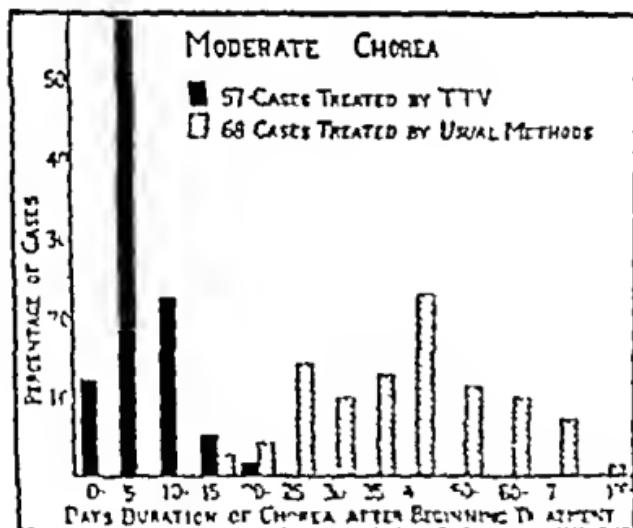
Fig. 100—Duration of the chorea after beginning of treatment in 125 moderate cases. (Jour. of Ped. C. V. Mosby Co.)

standing cases. The next slides (Figs. 99–102) show the difference in the duration of the chorea in the patients treated on the Children's Medical Service at Bellevue Hospital before

and after the advent of fever therapy They show also that
the mild cases were stopped in the shortest time, the moder
ately severe cases took slightly longer, and the severe cases
longer yet The average duration of the chorea for the whole
group as well as for the subgroups is far less than in those not
given fever therapy

It seems to us quite clear that this method of treating
chorea is more satisfactory than any other we have used, in
that the duration of the attack is markedly shortened The
disadvantages of the treatment are First, the unpleasantness
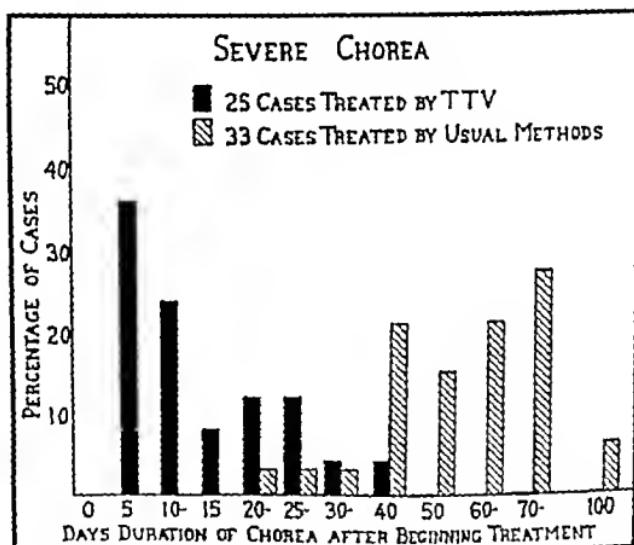
Fig 101 —Duration of the chorea after beginning of treatment in 58 severe
cases (Jour of Ped , C V Mosby Co)

to the patient of the foreign protein shock, and second, the
fact that the fever is not really controllable, i e , a good
febrile response is not always obtained and the temperature
stays high for only a short time Only minor compl cations
have occurred in our patients About a third develop herpes
labialis, two showed slight temporary jaundice and enlarge-
ment of the liver, and one had urticaria No bad effects ap
peared in those who had either active or inactive heart dis-
ease Typhoid-paratyphoid vaccine has been used for many
different conditions for a great many years with very few com-
plications, and for that reason can be considered a relatively

safe procedure   Occasionally the fever goes higher than is advisable but there were no disastrous results in our series in the patients treated with vaccine alone

QUESTION —How long does the treatment have to be continued and how do you tell when to stop?

ANSWER —The treatment is continued daily until the chorea is over   The exception to this is, when the child seems exhausted, and in need of a day off   Also it is better for the parents not to see the child during a reaction, and for that reason, treatments are seldom given on visiting days   Some-
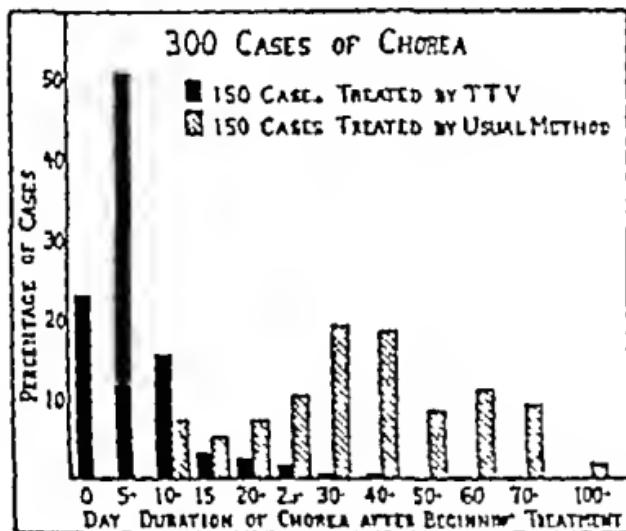
Fig. 102 —Duration of the chorea after beginning of treatment in 300 cases
(Jour of Ped, C V Mosby Co)

times, especially with repeaters and with the severe cases, it is a little hard to tell when the attack is definitely over, and the remaining incoordination of voluntary movements is on the basis of hypotonia or of habit   In such cases, massage and occupational therapy is begun   If with this regime muscle tone returns and the coordination improves, it is clear that the persistence of the disease process is not responsible for the residual symptoms

QUESTION —You said that the typhoid paratyphoid method of inducing fever is not wholly satisfactory   Is there any better way?

ANSWER —There are a number of other ways of inducing fever which are better from the point of view of ability to raise the temperature to the desired level, and to maintain it there for as long as necessary   Radiothermy, diathermy, and radiant energy all will do this   With the first two methods the practical difficulties are the expense of the apparatus, and the danger of burning the patient   Dr Stafford Warren and his accociates of Rochester, N Y, found that radiant energy obtained from carbon filament bulbs will raise the temperature just as well, the apparatus can be made by any skilled carpenter and electrician, it is inexpensive, and there is little danger of burning   He has recently published a description of this apparatus   About a year and a half ago we had one made for use on the Children's Medical Service at Bellevue Hospital, and have treated about 25 children with chorea in it   The series of cases will not be analyzed until more have been done, but I will tell you about one fairly typical result   The patient, a girl of ten, was in her first attack of fairly severe chorea which had lasted about three weeks, and was gradually getting worse   After the usual few days of observation and study, she was put in the box about nine o'clock in the morning   Some of you have seen the box which is made of celotex, with a light wood frame   Four carbon filament bulbs are in the top, and the light shines directly on the patient, who lies stripped on a mattress made up like a bed   The head is not in the box   At first the lights are turned on full, but when the temperature is high they can be dimmed by means of a rheostat   The girl's temperature soon began to rise and in about one and one-half hours had reached 106° F   She was uncomfortable while the fever was going up from 103 to 105 8° F, but after this she quieted down and seemed fairly comfortable   Good results are obtained in chorea by keeping the temperature around 105° F, but the patients are so much quieter and so much more comfortable when it is at 106° F, that we aim to keep it there or just above   The girl sweated profusely and drank large quantities of water during most of the treatment   The skin of her thighs became

erythematous, so she turned from side to side, and sometimes lay on her abdomen in order to minimize the chance for the first or second degree burning which occasionally occurs She was a little hard to handle while the temperature was rising rapidly, as the choreiform movements become very marked, and for a time restraints had to be put on her wrists and ankles Her temperature was maintained at about 106° F for five hours continuously, the lights were then turned off, the box and all the windows in the room were opened and she was allowed to cool off In three quarters of an hour her temperature was back to normal, she was sound asleep and was taken back to the ward She slept through until the next morning On the second day after the treatment there was a noticeable diminution in the choreiform movements, and the improvement continued so that one week from the treatment day she showed no sign whatever of chorea A number of our patients have responded just as strikingly as this one to the fever, but several others have needed a second treatment

I want to emphasize the fact that I am not telling you about this way of producing fever with the idea that it is necessarily the method of choice in the treatment of chorea. Until we have been able to treat more patients we cannot say definitely whether or not the attacks are made any shorter than by the daily use of the vaccine, and this, plus the consideration of the patient's comfort during the treatment, will be the final criterion From the point of view of ability to produce and maintain a given temperature In a patient it is a satisfactory method, and that is all you need to remember about it at present It has certain inherent dangers, just as any somewhat heroic therapeutic measure has, and is not a thing to go into lightly

I have tried to demonstrate to you this morning just one thing that induced fever is capable of cutting short any given attack of chorea I am not prepared as yet to say what method of giving hyperthermia is the most desirable from every point of view nr whether the good results go beyond the stopping of the attack No conclusions can be drawn

about this point until the patients have been followed for several years after treatment   Fever therapy in chorea is justified for at least two reasons   (1) Chorea is a distressing disease which may terminate fatally, and which is in many cases followed by heart disease, and (2) if left untreated may be so prolonged that the child's education is seriously interfered with

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CLINIC OF DR CHARLES GILMORE KERLEY

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DIFFICULT INFANT FEEDING CASES

When a case of difficult feeding in an infant applies for treatment, the patient is given a complete physical examination in order to discover hidden agencies that might explain in whole or in part the food incapacity of the patient This examination includes the blood, urine, mouth, ears, the heart, lungs (in many by x ray), liver, spleen and the condition of the sphincter ani muscle

If there is a story of persistent vomiting an x ray in addition to stomach lavage is carried out with a view to determine the emptying time, the presence of a possible hypertrophic pyloric stenosis or simple pyloric spasm

Carrying out this plan throughout the years we have found practically every ailment of early life responsible for the gastro intestinal deficiency In our findings are included chronic nonsuppurative otitis, mastoid disease, early adenoids, sinusitis, pulmonary tuberculosis, chronic bronchopneumonia, atelectasis, congenital heart, syphilis, congenital and secondary anemia, habitual respiratory spasm from allergic sources, hypothyroidism, microcephalus, advanced rickets, pyuria Regardless of its nature or location any diseased process in an infant is invariably accompanied by lessened food capacity The presence of *symptomless disease* is one of the peculiarities of early life and one of its dangers

The burden of complaint in the difficult feeders rests upon the gastro intestinal tract which supplies the dramatics *Failure to thrive loss in weight and gastro intestinal disorders of*

an urgent nature Assuming that the patient proves to be a feeding problem of a functional nature and breast milk is denied him, we are required to supply a substitute The infant's organs of digestion and assimilation are fashioned for the utilization of human milk, which is made to fit the digestive possibilities of the infant Regardless of the type of artificial food selected it remains substitute feeding, this fact is not to be forgotten

Because of ready availability the milk of the cow is the universal substitute, not only for the nutrition of the human infant but for the offspring of the lower animal Years before I attempted substitute measures in infant feeding I had considerable experience during boyhood in supplying nourishment to the early orphaned young of the lower animals I learned that for success in this field cow's milk required modification to meet the digestive possibilities and nutritional requirements of the young animal For their best interests the newly born orphaned pig, lamb or colt required that the milk be diluted and sugar added—in short, *modified* Neglect to do this resulted in indigestion, enteritis, malnutrition and a high mortality

My task is limited to the difficult cases and the above remarks are offered to emphasize that in the infant, the same fundamentals have to be considered in using foreign food and the lack of appreciation of the necessity of careful adaption to age and condition, a rearrangement of the nutritional elements, fat, protein, carbohydrates, mineral salts in cow's milk is the cause of perhaps 90 per cent of the difficult feeding cases that apply for treatment There are comparatively few newly born infants when fed on fresh cow's milk suitably adapted that will not thrive The underlying error rests in the feeding of cow's milk in too strong a mixture, the feeding of cereals too concentrated and particularly the early use of vegetables— in short, feeding out of time and manner When a badly fed child thrives, it is unfortunate for others as the physician will conclude that the plan employed is quite the proper one A great majority of the badly fed will surely at some time de-

velop disorders of digestion with resulting failure in growth
and development if not by actual illness

The difficult feeders are quite similar in their appearance
and in their history of overfeeding   There have been frantic
changes from one food to another in the hope that something
will be found to agree with the child   He fails to gain or he
is losing in weight, there is colic, often vomiting, sometimes
diarrhea or constipation   The baby is pale, thin, muscles soft
and flabby and the abdomen often distended   The *celiac child*
and the near celiac are often the end result of prolonged feed
ing errors, a faulty adaption of cow's milk

Management—Our suggestions apply to the rare infant
whose only trouble is his inability to utilize fresh cow's milk
and to those whose digestive organs have been subjected to the
shock of unsuitable food and faulty feeding measures with
resulting disease or greatly disturbed function

For such infants fresh cow's milk is never attempted—
better measures consist in the use of evaporated milk or one
of the dried milk proprietary preparations   The evaporated
product has proved of signal value in many hundreds of in
fants, for years its use was frowned upon by pediatricians, it
was considered a highly unscientific method of feeding an in
fant   That evaporated milk is supplied in a tin-can container
and may be obtained at the corner grocery doubtless exerted
an influence prejudicial to its use   Evaporated milk has been
used in children's hospitals and institutions for years, of neces
sity and sometimes with apologies

For many years I have advocated the use of evaporated
milk in various publications   My first introduction came about
in a dramatic fashion as a result of the great blizzard of 1888
at that time I was resident physician at the New York In
fant Asylum in Westchester County N Y   At this institution
there were a few over 400 children and about 200 mothers
The age of the child population ranged from infants of a
few weeks to children five or six years of age   Among those
under one year were perhaps 100 who were partly or entirely
dependent on cow's milk feeding   Eight can of loose milk a

day were supplied by a dairy eight miles distant, the milk being delivered in a horse-drawn truck—then came the big blizzard completely blocking traffic of every nature—in our case for seven days   I well remember our consternation and alarm at the thought of being cut off from all food supplies with over 600 people to be cared for   A few days before the historic storm, through error a large consignment of Borden's condensed milk arrived at the institution   Twelve dozen cans had been ordered and 12 gross (1728 cans) were received   Our greatest anxiety naturally centered on the bottle fed, the condensed product was at once brought into use and a blizzard feeding plan was inaugurated through dilution with barley water   Greatly to our surprise the marasmic and difficult feeders, struggling along on diluted sterilized milk, took on new life, began to smile and gain in weight

In the early years sugar was invariably added at the evaporating station for the purpose of preservation   Later the process of maintaining the milk without the addition of sugar was established   This evaporated product was first known as Evaporated Cream   The name was changed later to Peerless Brand and again later to Evaporated Milk, the trade name which has continued to the present time

During the procedure of evaporation, certain changes take place in the milk which make it easier of assimilation   The finer division of the fat globules and a change in structure of the protein content by means of the homogenizing process doubtless explains in part this feature   It would seem also that a change takes place in the protein content, probably a result of the action of proteolytic enzymes inherent in milk that makes the product more readily assimilable   When placed in cans and sealed, it is heated at a temperature of 200° F   In food value 1 ounce represents a trifle over 2 ounces of fresh milk and has a caloric value of about 42

In the great majority of feeding problem cases, evaporated milk, starch, sugar and water comprise the formula, for purposes of better assimilation the starch is cooked with a designated quantity of milk and water for one-half hour in a double

boiler—sugar is added after the completion of the cooking,
likewise boiled water to make up the amount lost in cooking
Baked barley, wheat or oat flour is used to supply the starch

The first formula for a 9 pound, four months-old baby
without diarrhea or vomiting would be something like the
following

Evaporated milk	6 oz.
Water	24 oz
Starch	1 oz.
Sugar	1½ oz.

The parents are instructed *not to expect a gain in weight
immediately* and that there may be a small loss—later as the
infant shows a capacity to take care of the food, it is strength
ened by the addition of 1 ounce at a time removing 1 ounce
of water—usually 5 ounces are given at four hour intervals
If there is vomiting habitually or habit regurgitation, thick
gruel feeding is often brought into use—the evaporated
product supplying the milk substitute In the vomiting cases
there is usually an associated mucous gastritis which is best
controlled through lavage carried out four hours after the com
pletion of the feeding It may be of advantage to repeat the
lavage every few days If the vomiting is persistent and pro-
jectile and shows other signs of pyloric involvement such as
constipation and the characteristic peristaltic stomach wave,
an x ray study should be made In those with a tendency to
frequent evacuations lactic acid CP 25 mm is added to the
formula after it is cooled and just before dividing the formula
into the day's feedings

Reference has been made to celiac disease which varies
greatly in its degree of severity In these infants, milk of
every nature is discontinued—the best substitute in my hands
consists in the use of a calcium caseinate or Casec.*

* Casec made by Mead Johnson & Co

CLINIC OF DRS ALFRED E FISCHER and HARRY MACKLER

Mt Sinai Hospital

INSULIN IN DIABETES OF CHILDHOOD

Sufficient knowledge has been gained about the use of insulin in the treatment of diabetes in infancy, childhood and adolescence to warrant a review of its use based on experience with 65 juvenile diabetics over a period of eight years   The first three questions which arise after the diagnosis of diabetes has been established are

1 Should the child be put to bed?
2 On what dietary régime should the child be placed?
3 Should the child receive insulin?

1 It has been shown that a body debilitated through loss of sugar in the urine and consequent loss of weight is in need of rest to restore its normal metabolic processes during the early period of adjustment to the diet and insulin   It usually requires from four to six weeks to properly regulate the diet and insulin in the initial stage of juvenile diabetes   This is done preferably in a hospital so that the child's carbohydrate tolerance can be properly determined   Moreover, since the child at first is given a rather low caloric intake, it is advisable to keep him at rest a good share of the day

2 It has been the custom in the Children's Department at Mount Sinai Hospital to prescribe a diet of approximately 40 calories per kilogram, 25 per cent of the total calories in carbohydrate 15 per cent in protein and 60 per cent in fat This will more than cover the minimal basal requirement Starvation is not essential at the beginning of treatment for

in the simple uncomplicated new diabetic patient, glycosuria can readily be controlled even though the patient is on a fairly adequate caloric intake   As the tolerance improves, more carbohydrate is permitted   This enables the physician to obtain the child's cooperation and thereby avoids future dietary excesses which might delay improvement

3 Every child receives insulin from the first day of his treatment but the smallest possible dose which will produce a sugar-free urine is given   Large doses of insulin are avoided as they lead to overfeeding   Overfeeding leads to obesity which in turn again increases the insulin requirement   By avoiding overfeeding, therefore, one is enabled to keep the dosage low   This is particularly desirable in the initial stage of treatment because the requirement for insulin rises later in most instances

Insulin is given to every child because

1 The use of insulin allows a more liberal diet

2 It enables the child to become sugar free quickly

3 It stops polyuria and polydipsia immediately with the cessation of glycosuria

4 It increases the sense of well-being and stops hunger

5 It produces better tissue turgor because carbohydrate and water are once more retained in the tissues

6 It shortens the period of initial hospitalization

7 It acts as a cushion or "buffer" against loss of tolerance incident to illness

While these facts justify the use of insulin in every child at the onset of treatment, it is, however, not imperative that insulin be used in every case   Children can be made sugar free without the use of insulin as in the pre-insulin era   Their tolerance can be built up slowly by gradually increasing the caloric intake   However, every one of the 65 diabetics that has been treated in our clinic has eventually required insulin   We have treated a few of them without insulin for six months, some for even a shorter time   Any infection, no matter how trivial, immediately disturbs the carbohydrate metabolism, causes glycosuria, loss of weight, and leaves a

child dissatisfied with his diet. The consequent decrease in carbohydrate tolerance inevitably leads to the use of insulin because an adequate diet must be offered to the patient. It has not been possible for us to keep any diabetic child on an adequate regimen without insulin for longer than eighteen months During that period of time development is usually at a standstill, months pass without any gain in height and weight The patient becomes dissatisfied with his diet and loses his morale For these reasons insulin is now given to every diabetic who comes to the hospital from the first day of treatment

There is, to our knowledge, no way of estimating how much insulin a child with glycosuria will require However, in order to follow the progress of a case, one must have some measure of its severity This is done by estimating the carbohydrate tolerance, which can be measured conveniently by calculating the total number of grams of available glucose in the diet and dividing it by the number of units of insulin required to keep the urine sugar free, according to the formula

$$\frac{100\% \ C \ + 58\% \ P \ + 10\% \ F}{\text{Units of insulin}} = x$$

If there is glycosuria, the grams of glucose excreted are subtracted from the number of grams ingested The larger the figure x, the better the tolerance When the tolerance for carbohydrate decreases, more insulin is required and x falls

THE USE OF INSULIN IN THE EARLY CASE

Insulin is very effective when it is first used and even in small doses will arrest glycosuria in the uncomplicated case of childhood diabetes A dose of 5 units twice a day in a small child and 10 units twice a day in an older child may be sufficient to render the urine sugar free in a few days

Every voided specimen must be tested One must watch carefully for the appearance of sugar free specimens for these may come very quickly and unexpectedly Insulin reaction have been observed as early as the third day following the use of even small doses in children that have been admitted

to the hospital with severe glycosuria   As soon as the urine
becomes sugar free the diet must be raised or the insulin
lowered   It is better to take one step at a time rather than
to combine them   If the diet is increased it is a good idea to
raise the carbohydrate first, then the protein and then the fat,
no more than 5 or 10 Gm at a time and not oftener than
every three or four days   The effect of the increased diet
may not be apparent until several days have passed   If the
urine remains sugar free with the increase in diet, the dose is
left unaltered   If the child shows glycosuria in any voiding,
however, the insulin is raised 1 unit at a time first at one dose
and then at the other   Inasmuch as young diabetics are very
sensitive to insulin, the dosage should not be increased too
rapidly   It is unnecessary for reactions to occur in the early
stage of treatment if the dose of insulin is not increased after
the specimens become sugar free   On the other hand, it is not
a good plan to interrupt the use of insulin even for a day or
two as improved tolerance which has been developed with a
sugar-free urine will soon be lost if insulin is stopped for any
period of time

The proper timing and division of the insulin dose is ex
tremely important   It may enable a child to get along both
with fewer units and fewer injections during the day

In a mild diabetic the effect of an insulin injection lasts ten
to twelve hours   Therefore, it is preferable to start the dia-
betic child on two daily doses of insulin even though only a few
units are given with each injection   Occasionally one dose will
suffice for a short time, more often a second dose is soon
needed   An early case will seldom require more than 40 units,
20 in each dose, a third dose is hardly ever necessary   Theo-
retically, of course, it is better to divide the dose into as many
small components as possible in order to keep the blood sugar
at a level more nearly approximating the normal   In early
diabetes some endogenous insulin still works effectively, par-
ticularly after the patient has become sugar free   For that
reason it is not necessary at first to supply three injections of
exogenous insulin

When two doses are ordered the first is given from twenty minutes to one half hour before the morning meal and the second dose either before or after the evening meal The daily dose is divided equally at first when it is given in two daily injections If it is found that the blood sugar is highest in the early morning, slightly more than half of the daily dose is given before breakfast On the other hand, the larger dose is given in the evening if the blood sugar just before supper is higher than that before breakfast

There are two sources of blood glucose, the first an alimentary or exogenous source, the second on endogenous one derived chiefly from liver glycogen As diabetes becomes progressive, there is hyperglycemia and glycosuria in the early morning, in spite of the overnight fast, probably due to liberation of liver glycogen The early morning rise in blood sugar can be partially controlled by postponing the evening dose of insulin until after the evening meal

THE USE OF INSULIN IN LONG STANDING CASES

In rapidly growing children, the simple early case of diabetes may become difficult to control after four or five years Most of the cases under treatment have had to double their initial dose of insulin within five years, some even sooner Dietary excesses and infections play a role in the diminished tolerance for glucose but even in children who cooperate beautifully, loss of tolerance is often seen This can most likely be explained by the increased metabolic demands of the body associated with growth and development Often this loss of tolerance is very marked during early puberty In the growth of normal children the function of the pancreas is maintained with the other organs of the body In diabetes, however, either the pancreas it self becomes less competent physiologically or other glands or organs in the body inhibit its action as the child grows older

The majority of cases of juvenile diabetes under treatment for five years require three injections of insulin daily After the daily dose exceed 40 units it is usually divided into three

injections in order to avoid insulin reactions   Large single
doses are inefficient, for some of the insulin is excreted un
changed in the urine and some may be inactivated in the body
The time of the injections is rearranged, likewise the diet.
Insulin loses its effectiveness in severe cases in from six to
eight hours, therefore one must space the injections so that
a dose is given about every eight hours throughout the twenty
four   One should not regard insulin as a digestant to be
taken before meals   On the contrary, it is given at such
times as it best meets the rising tide of the blood sugar
This often bears no direct relation to feeding hours   Its
maximum action occurs from three to four hours after in
jection although some of its effect is still present at the end of
eight hours   It is for that reason that when three daily doses
become necessary, the first dose is given one-half hour before
breakfast, the second dose in the midafternoon, and the last
dose before retiring   The exact time at which the insulin is
injected will vary with the daily routine of the child, school
hours, etc   The child's daily life must be interfered with as
little as possible and for that reason one may space the insulin
a bit differently when necessary   Most of the daily dose, about
two-fifths, is given in the early morning, from one-fifth to one
third in the midafternoon and the remainder at night   For
example, if 50 units daily are given, it is divided so that 20
units are given before breakfast, about 10 to 14 in midafter
noon and from 16 to 20 at night   Reactions must be watched
for and the feeding hours rearranged in order to help control
them   If glycosuria occurs in the early morning voiding, a
larger dose should be given at night unless a reaction during
sleep makes this inadvisable   In cases which are sensitive to
insulin or in those whose diabetes becomes progressive, 4 or
even 5 daily doses of insulin may become necessary

The dosage of insulin is more or less proportionate to
the age of the patient, and the severity of his diabetes
Whereas one unit may be effective in an infant or in a child
who has just become diabetic, 5 or 10 units may be ineffectual
in an older or long standing case   This rule is, however,

not universal   Some of the children have not had to increase
their insulin for several years   Once they have gotten out
of control, however, they always require larger amounts of
insulin   Of 54 patients under regular observation, 25 are tak
ing two doses, 27 three doses and 2, four doses of insulin daily
Among those receiving two injections, the minimum dose is 10
units and the maximum 44 units daily   Those receiving three
doses take as little as 30 and as much as 105 units daily   Of
the two children who are injecting insulin four times daily,
one receives as little as 32 units a day and the other 115   The
child who receives 32 units is very sensitive to insulin and must
take 4 injections daily in small amounts in order to avoid severe
reactions

INSULIN DURING INFECTIONS

An infection invariably means a loss of carbohydrate toler
ance, which may be slight or great and depends upon the nature
and severity of the infection   The loss of tolerance requires
either a decrease in the food intake or a rise in the amount
of insulin administered, more frequently both   The fat and
protein in the diet are usually reduced at once in order to avoid
acidosis and also because the child as a rule has no desire for
food   If acetonuria occurs in spite of the decrease in the
ketone producing factors in the diet, carbohydrate must be in
creased and both the number of units and injections must be
raised   The treatment for an external infection such as a boil
is similar to that for any febrile illness   If the patient has a
high fever, more drastic measures are necessary   Carbohy
drate drinks, such as orangeade milk shakes, and water ice
should be taken   The urine must be examined repeatedly so
that neither too much nor too little insulin is given   After the
infection has subsided and the carbohydrate tolerance has re
turned, the extra dose of insulin may be decreased and finally
withdrawn   Usually after a severe illness the tolerance is slow
in returning   On the other hand even after some illnesses
(scarlet fever chickenpox) where there has not been a severe
pyogenic infection the carbohydrate tolerance may be only
slightly altered

TREATMENT OF A SEVERE CASE

Occasionally one encounters a diabetic child who cannot be controlled under the usual regime of a limited carbohydrate intake and 2 or 3 insulin injections daily   Sometimes this follows an infection or an eating orgy   Occasionally the cause cannot be determined   The child must then be given a simple diet consisting of readily available carbohydrate (bread, crackers, milk, orange juice, cereal) and 6 insulin injections daily at four-hour intervals   As soon as the urine becomes sugar free both the dose and number of injections can slowly be decreased and fats and proteins gradually added to the diet In one patient, a regime of 6 daily injections was finally successful in maintaining a sugar-free urine and excellent carbohydrate tolerance developed after six weeks of intensive hospital treatment   Apparently in this patient insulin was either destroyed rapidly or else lost its effect in a very short time When the patient's tolerance began to return, insulin again became more effective and the child was placed on three daily injections and did very well

INSULIN REACTIONS

The symptoms incident to insulin reactions are too well known to warrant their detailed description   They are extremely variable and frightening but for the most part entirely harmless   Some children have actually had hundreds of reactions during the course of their diabetes, many of them severe and convulsive in character but without any demonstrable cerebral damage   Convulsions with loss of memory can take place at night and there is frequently no recollection of their occurrence the following morning   There is no mental deterioration following repeated convulsions caused by insulin In cases which are unusually sensitive to insulin it may be necessary to give as many as 5 daily injections, unpleasant though this may be, in order to avoid reactions

On the other hand, the symptoms may be so slight that the reaction is not even recognized by the patient   One of the signs which is frequently overlooked is a general cold-

ness of the body associated with a hypothermia   A tem
perature of 94° F was recorded in one child who was asleep
and totally unaware of an insulin reaction

Reactions occur more frequently in the spring and sum
mer months when a diabetic child is enjoying a greatly in
creased amount of exercise   More carbohydrate is com
pletely utilized during exercise and consequently less insulin
is required   Therefore, reactions are likely to occur when
there is increased muscular activity unless the dose of insulin
is lowered   Contrary to some observers it has been the ex
perience in this clinic that children receiving higher carbo
hydrate diets are more liable to reactions   There are children
who are very sensitive to insulin and develop reactions easily
regardless of their diet   The exact mechanism which pro
duces the reaction is not known

Fortunately most reactions are mild and the children re
spond readily within one half hour to the administration of
10 Gm of carbohydrate by mouth   In children who are
susceptible to insulin it is a good plan to subdivide both break
fast, lunch, and dinner into two separate smaller meals   By
this plan the child receives something both at breakfast and
at 11 A M , at lunch and at 3 30 P M , at supper and at 9
or 10 P M before retiring   The postponed portion of the
meal is given at the time of the expected insulin reaction   If
the reaction is anticipated at 11 A M it may sometimes be
overcome by having the patient eat 10 or 15 Gm of carbo
hydrate about 10 45 A M   This procedure often avoids a re
action, but it is not infallible, a safer method is to reduce the
dose of insulin one or more units on the following day   The
reduction is made at the injection following which there had
been a reaction on the previous day   However if reac
tions cannot be successfully eliminated, one must further sub
divide the dose of insulin and as many as 5 daily injection
may have to be given in order to avoid a reaction   Even then
there is sometimes a cumulative effect of insulin which may
vary from day to day and the reaction may occur at a totally
unexpected time   Patients are always instructed to carry

sugar with them and although most children can feel the on
set of a reaction, it may occur without any warning what
soever   Occasionally the reaction is so severe that the child
cannot open his mouth to swallow sugar or orange juice   In
that case 0 3 cc of adrenalin hydrochloride should be injected
hypodermically and repeated in twenty minutes if necessary
Adrenalin mobilizes glucose and usually is effective in over-
coming the hypoglycemia   The parenteral injection of glu
cose is seldom necessary yet one occasionally has to resort
to its use   Even though the reactions may appear to be
severe, fatalities are practically unknown in childhood   There
is no danger of the cardiac collapse which may occur in elderly
individuals with coronary artery sclerosis   The fear of in
sulin reactions once established is extremely difficult to over
come and it is therefore advisable to avoid repeated reac
tions if it is at all possible to do so   Even though the reac
tions are not serious in childhood, they constitute a mental
hazard and parents who witness reactions will be inclined
to give less than the prescribed dose of insulin

TREATMENT OF COMA

It will only be possible to outline briefly the proper
methods for treating coma   The principles of the treatment
of coma are

    1 To eliminate ketones and to prevent their formation
    2 To replace body fluids
    3 To diminish hyperglycemia
    4 To produce diuresis
    5 To support the vascular system

Coma is an emergency which is far more acute than a
surgical operation, or the treatment of an accident case   The
Children's Department at Mount Sinai Hospital has adopted
a systematic type of procedure which has been uniformly suc-
cessful in the treatment of coma

    1 Special day and night nurses are ordered at once
    2 Urine sugar is obtained on admission   If the child is
unable to void, he is catheterized   If authentic urinalysis

has been obtained shortly before admission, catheterization
is not necessary

3 Blood sugar and CO_2 combining power of the blood
plasma are estimated as soon after admission as possible

4 If the urine sugar is high and the child is obviously in
diabetic coma, 25 units of insulin are given subcutaneously
and intravenously simultaneously even before the blood sugar
and CO_2 have been reported

5 These procedures are usually done in the admitting
ward   Later a stomach tube is passed and if any quantity of
fluid is present, the patient is lavaged carefully   As much
as 700 cc was present in one patient's stomach without any
visible abdominal distention

6 A colon irrigation, and if the child is in collapse, a re
tention enema of hot coffee is given

7 The patient is covered with hot blankets

8 Since most patients have been vomiting, nothing is
given by mouth for four hours   Even though the pulse is
feeble and rapid, cardiac stimulation by drugs is usually not
necessary   Increased blood volume results from the adminis
tration of fluids intravenously   This in itself will control
vasomotor shock and raise the blood pressure

9 At least 500 cc of normal saline solution are given sub
cutaneously shortly after admission   An intravenous drip of
normal saline or 5 per cent glucose in Ringer's solution is be
gun as soon as the child is admitted to the ward   *If the blood
sugar is 0 or 0 250 mg no glucose is given*   If the patient is
restless and thrashing about, it may be necessary to tie a needle
in the median basilic vein and to tie the arm to an arm board
The first 100 cc are given rapidly   The fluid is then permitted
to flow at the rate of 50 cc per hour   The amount of fluid
administered is dependent upon the response of the child to
treatment   When the dehydration is extreme much larger
amounts of fluid are required than otherwise   As much as
3000 to 4000 cc of fluid have been given in twenty four hours
to a even year-old child   Usually 1500 to 2000 cc in the
first twenty four hours is sufficient however   The replace

ment of fluids is just as important a part of the therapy as the use of insulin

10   Constant vigilance is necessary   The special nurse is required to keep a "coma chart" on the wall at the bedside. The temperature, pulse, respiration, the amount of fluid, insulin, and glucose administered, and all other details are carefully charted   Some of these items are recorded at half hourly intervals   In this way a graphic chart can be seen at a glance   Some member of the resident staff of the hospital is likewise in almost constant attendance

11   Blood sugars are taken as often as every two hours during the early stage of the treatment   If the blood sugar falls rapidly, subsequent doses of insulin are given with glu cose   But glucose is only given if the ketosis persists after the blood sugar has fallen to normal   In severe acidosis it has been the custom to give approximately 1 Gm of glucose for each unit of insulin   There can be no definite rule as to how much glucose and insulin each child will require   If the child is not vomiting, the glucose can be given by mouth in 15 cc amounts in the form of orange juice   Treatment is carried on from hour to hour, the amount of fluid, insulin, and glucose being dependent upon the chemical findings in the blood and urine

12   After the initial intravenous dose of insulin, subse quent doses generally are given subcutaneously at the rate of 10 to 20 units an hour   Here again one cannot make a standard rule   If the coma does not respond to treatment, insulin injections are given half-hourly and in larger amounts

13   There is usually suppression of urine in diabetic coma One therefore aims to obtain diuresis   Once this is established, however, there is danger that the continuous use of intravenous glucose will cause polyuria, with the excretion not only of glucose and ketone bodies but also of insulin Because of this, one must guard against excessive administration of solutions of glucose intravenously

14   The parenteral administration of fluid is stopped only after the patient has taken sufficient fluid by mouth for several hours without vomiting

15 Since there may be a small loss of base it has been
found advisable recently to give Hartmann's solution[1] instead
of Ringer's or normal saline solution   One hundred cc of a
5 per cent solution has been used at times in conjunction with
normal saline or Ringer's solution   Hartmann's solution avoids
the danger of alkalosis which occasionally was reported in
the past when solutions of bicarbonate of soda were used

16 The prognosis of coma in childhood is excellent pro-
vided the patient responds within forty eight hours   After
that, however, the body cells of the diabetic organism do not
respond as well to treatment and the prognosis becomes more
serious

The factors then which will alter the amount of insulin
in any given case are

1 Duration of the disease

2 Severity of the disease

3 Cooperation of the patient in helping maintain a sugar
free urine

4 Rapidity of growth

5 Puberty

6 Repeated infection or illness

7 Type of diet

   (a) Restricted or more liberal carbohydrate intake

   (b) Restricted or more liberal fat intake

8 Exercise

9 Coma

INSULIN SUBSTITUTES

From time to time insulin substitutes have appeared on
the market   Most of them can be taken orally and there-
fore have a strong appeal to the public   Among the products
which have been advocated are synthalin and neosynthalin
These substances are guanidine derivatives and lower the
blood sugar   This action however is quite different from

[1] Hartmann's solution is a solution of sodium lactate and magnesium ... sodium potassium and calcium chloride   It is of about ... from the H... ... Chicago ...

that of insulin   Guanidine is a liver toxin and as such inter
feres with the liberation and storage of glycogen

Respiratory quotient studies purporting to demonstrate
that synthalin raises the respiratory quotient are inconclusive
and it is therefore doubtful whether synthalin aids in the com
bustion of glucose   On the other hand, toxic hepatitis, icterus,
and cirrhosis have been known to follow its use   It is there-
fore a dangerous drug   The ability to reduce the blood sugar
has also been claimed for extract of mulberry (myrtillin)
and for Jerusalem artichoke   These foods are harmless and
can be taken by diabetic patients   They are not potent
enough, however, to warrant their use in the diabetes of
childhood

Insulin itself has been treated or combined in various
ways so that it might be given without hypodermic injection
For example, a solution in oil has been advocated for intra
nasal use, inasmuch as insulin is absorbed from the mucous
membranes   Its action by that means, however, is uncer-
tain   The inhalation of insulin by means of an atomizer has
also been advised but that method is likewise unsatisfactory
In addition, a solution of insulin in oil has been prepared for
hypodermic injection to allow slow absorption of insulin from
the subcutaneous tissues, necessitating fewer injections   This
preparation, however, has not been found to be effective   The
French have combined insulin with a blood pressure regulating
fraction of the pancreas for the purpose of preventing reac-
tions   This combination has not had widespread use, however,
because reactions have been observed in spite of its adminis
tration   Other combinations of insulin have made their ap-
pearance from time to time   All these substitutes have had
only a short vogue because they are unsatisfactory and one
must therefore conclude that insulin at the present time can
not be replaced

EDUCATION

Proper education of diabetic children and their parents
is essential to optimum care   This is begun in the hospital
where the patient is taught all about his diet and how to meas

ure his own insulin Either the mother or father or both are also urged to come and receive instructions A mother who six months ago believed that it was impossible to give her child insulin has become so proficient that she now not only injects insulin herself but regulates the dose so that her child is sugar free and still does not go into insulin shock

The site of injection must be changed daily The extensor surface of both arms, and thighs and the buttocks are the sites of predilection The child must be cautioned against injecting the insulin too frequently in one area as it may cause either atrophy or hypertrophy of the subcutaneous tissues The syringes and needles must be sterilized carefully and the hands thoroughly scrubbed before each injection

Each child should carry some sort of identification card or means by which anyone can learn readily of the child's diabetes in case of accident His physician's name and telephone number should be written on a card or tag with the request that he be notified at once of an accident to his patient

The significance of slight infections must be stressed repeatedly, as well as the need for the immediate reduction of fat and protein in the diet and the increase in carbohydrate and in insulin in the presence of even minor infections The necessity for urinalysis at home is likewise emphasized and all of the child's daily routine is thoroughly supervised With out proper education one cannot succeed in the intelligent and satisfactory management of the diabetic child

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CORRECTIVE MOTOR EDUCATION OF BIRTH INJURIES AND ALLIED PROBLEMS

DURING the past three and a half years, many children have presented themselves for examination and treatment at the Department for the Reeducation of the Birth Injured at the Neurological Institute of New York because of various types of paralysis By far the majority of these cases have been paralyses resulting from birth injuries However, in this large group of approximately a thousand cases have been conditions not resulting from injuries at birth, but from such causes as encephalitis, poliomyelitis, muscular dystrophy, cerebral agenesis or hypoplasia, encephalopathies, peripheral nerve injuries and cerebral sequelae resulting from jaundice of the newborn

Cases selected and accepted for treatment depend largely upon the severity of the lesion, the age of the patient, the degree of the intellectual impairment, whether a progressive disorder or whether a hereditary affliction This calls for not only careful clinical examination but also careful analysis as to the intelligence rating special disabilities and in as many cases as possible, encephalogram studies and careful psychiatric and sociologic investigation The early history frequently is most valuable in attempting to establish a clinical diagnosis, especially in the cases of birth injury, where a diagnosis is not always simple to make Certain fairly constant features in the histories are helpful Immaturity, increased

somnolence or increased crying, asphyxia, apneic attacks, resuscitation at time of birth, irregular breathing, failure to suckle, rigidity, opisthotonus, rhythmical adduction and abduction, persistent singultus, yawning and frequent vomiting, convulsions, muscular twitchings and paralyses, are all points one must include in the history of the neonatal period   The outstanding symptoms in the birth injury group are convulsions and localized twitchings shortly after birth and difficulty in suckling

Whatever the cause or causes of the paralyses, the clinical examinations have shown all degrees of spasticity, ataxia, athetosis, choreic features, symptoms of anterior horn cell damage, trophic symptoms, endocrine changes, evidences of thalamus and hypothalamus dysfunction, and most any conceivable type of motor disturbance or combination of motor disabilities   The classical, clinical picture of spastic paraplegia is not the common or usual type of disorder encountered, but the clinical picture is often of greatly varied type, especially in the birth injury group

Pathological material unfortunately is difficult to obtain except for the brains of stillborn or those dying shortly after birth   Material of the later stages of nervous system change after birth injury show varied types of lesions and lesions scattered through almost any part of the nervous system including the spinal cord   Taking into consideration the widespread nature of the lesions, it is not difficult to understand why we find such a variety of clinical findings   Further confirmation is also given by encephalography, not only from the standpoint of estimating the severity and localization of the lesion, but also from the standpoint of differential diagnosis   In doubtful cases the encephalogram may be of great help in such conditions as agenesis, localized atrophy, porencephaly, brain tumor or cyst, and internal hydrocephalus

Localization of the lesions where there is choreo-athetosis and spasticity has always been a much disputed question, especially as to whether the disturbances in muscular movements resulted from damage of the basal ganglia or changes in the

cerebral or cerebellar cortex. When one recalls the underlying
pathology and the many nerve centers and pathways involved
in the production of muscular movement one can visualize
almost any kind of clinical manifestation. There are a group
of patients with choreo-athetosis and with various degrees of
spasticity, whose response to certain situations and to treat-
ment is such as to make one hesitate to place the lesion chiefly
in the basal ganglia. In them one might speculate upon dam-
age to the motor or sensory cortex. Observations on many
of the children under various circumstances show the striking
effects which such factors as fear, concentration, attention,
and self consciousness play in controlling or increasing ab-
normal movements or posture. Experimental work on this
subject which we have been carrying out and which is to be
published in a subsequent paper shows the greater ease of
performance of movements and the complete cessation of ab-
normal movements under the influence of drug or psychological
influences. The subjective feelings and the comments of the
patients together with the objective findings make one doubt
that in many instances the lesions which cause the choreo-
athetoid movements are in the basal ganglia. This point of
view is in agreement with the results of animal experiments by
other workers—especially the findings and conclusions of
Fulton and Amsler—that when higher centers in the nervous
system are damaged, the majority of impulses pursue the phylo-
genetically older paths across the cord or brain stem. With
the material at our disposal we are hopeful of making further
observations in the human beings and of correlating findings
with the principles of release of function, the common path
ways with reference to excitation, the cooperative interaction
between cortical and tonic contraction and other important
features of reflex physiology.

Investigations in reeducation of motor disabilities introduce
one into the very interesting field of conditioned reflexes and
especially into the field of psychic activity. In this connec-
tion one must recall that with the marked disturbances that are
encountered in the reflex mechanism of the spinal cord and

midbrain there are undoubtedly marked disturbances in the cortex   These manifest themselves in conditioned reflexes with the changes of the three fundamental processes of excita tion, inhibition, and disinhibition   If one accepts the state ment that one of the most essential functions of the cerebral hemispheres is the elaboration of the conditioned reflexes, just as the main function of the lower parts of the nervous sys tem are concerned with the simple unconditioned reflexes, then one can begin to understand that in individuals with cerebral injuries the difficulties for maintaining all equilibrium with the external forces of their environment are increased, and that, therefore, behavior and psychical functioning in that environment are influenced   This, in a measure, justifies at tempts to train or recondition individuals   The results so far obtained justify the attempt in acceptable cases to treat spastic choreo-athetoid states which result from birth injuries or from other causes

Aside from clinical studies and attempts at localization of the chief lesions, investigation must also be made in the intel lectual sphere   This is necessary not only to estimate the mental level of the patient but also to eliminate special dis abilities in speech, hearing, vision, reading, and writing, which are important for the intellectual and educational training of the individual   The majority of speech disturbances concern expressional speech which is a part of the general motor dis ability   The problems associated with left-handedness and other aspects of cerebral dominance make the situation in edu cation and psychometric examination more difficult   The study of these special disabilities may be of great help in out lining a general school program

At the Neurological Institute patients with birth injuries are first subjected to a thorough neurological study and then are placed on a schedule in which mental and muscle training are begun   Daily periods are allotted to muscle training fol lowed by periods of rest   For the remainder of the day the patients are kept occupied by studies and games that tend both to encourage muscular expression and to make the pa-

tient more objective in his thinking In order to make certain
that the parents and teachers are cooperating in the program
a close contact with the home or the school is kept with the
expectation of eventually placing the child in a normal school
environment if he is not already in it

It is very difficult to lay down or prescribe any one set of
rules for specific types of exercises For proper relaxation a
calm and quiet atmosphere is very necessary The exercises
must be adapted to the individual case and depend largely on
the clinical findings The chief aim of the exercises is to teach
the patient to make each active movement with a minimum of
muscular effort The teacher should be a person with tempera
ment and personality that is conducive to relaxation Before
the exercises are started there should be a preliminary relaxa
tion period Then exercises should be carried out with the
least amount of motor overflow, with just as little effort as it
takes to perform a free and easy movement The first exer
cises should be the slow, coordinated rhythmical forms of
movement, beginning with the major groups of muscles, such
as those about the proximal joints shoulder and hip, later in
cluding the muscles of the knees and elbows and finally those
of the hands and feet

In the younger children it is often necessary passively to
assist them until they are able to carry out the movements by
themselves After the control of the larger groups has been
accomplished placement exercises such as walking on lines,
putting fingers on dots, placing pictures on blackboards are
helpful Walking before a mirror is also helpful Treatment
by exercises in water is often conducive to relaxation, but the
ability to relax in the case of the spastics does not seem to
carry over as well as when the exercises
are given on the table, or are followed immediately by a short
period of exercises out of the water

As a rule it is better at first to allow the birth injured child
to do exercises as best he can—in spite of the fact that he is
making erroneous and uncontrolled movements in the first at
tempts Later the incorrect movements may be gradually

eliminated   Such a course is better than to restrict activity
to simpler movements with the expectation that the ability
so gained will be immediately carried over into the more com
plicated coordinated acts   Tongue placement exercises in front
of mirrors are useful in training of speech   This proceedure
is preferably carried out by the use of a blackboard so as to
enable the patient to write in large words at the same time that
he attempts to pronounce the word he is writing   The move
ment of the hand and arm often will take care of some of the
excessive flow of nervous energy which interferes with speech

Speech is a very intricate muscular process and its dis
turbance is closely linked with the general spastic condition
so that one cannot hope for much improvement until the pa-
tient has learned to control the larger groups of muscles or has
acquired a general improvement   Not infrequently speech or
acquisition of speech occurs with the successful accomplish-
ment of coordinated muscular movement without special em
phasis being placed on speech training itself

One must always keep in mind that one is working with
patients who have never been able to perform normal coordin-
ated movements   The situation is entirely different in the
case of the patient who was born with normal muscular con
trol and later in life acquired a paralysis   In the latter condi
tion, training is a matter of reeducation while in the birth
injured, training is not a matter of reeducation but an attempt
to establish patterns for normal coordinated movements from a
pattern complex of massive muscular responses which have
never been differentiated   In the older children training is
directed toward breaking up mass action patterns   This be-
comes easier as the child learns to cooperate   Such factors as
anxiety, fear, and self-consciousness increase the abnormal
movements and it is necessary to eliminate, as much as pos-
sible, the emotional element from the muscular act

In patients with marked cerebellar disturbances, one must
rely a great deal on vision in training the patients   The pa-
tient must look where he walks or focus on an object toward
which he is going   This is often helpful in maintaing equi-

librium If necessary, correction of impairment of vision by glasses, or correction of strabismus by operation may be exceedingly helpful

Much has been written on the clinical aspects of disorders arising from damage to the central nervous system by injury at birth, but medical literature contains little regarding therapy The progress in treating these conditions must be based upon a better understanding of the disturbances in the nervous system Normal muscular activity involves a balanced action and integration of the corticospinal (pyramidal) and the more diffuse, less direct, striatal (extrapyramidal) and rubrospinal and vestibulospinal systems Biologically old mechanisms in man are often brought into undue prominence by injuries The normal hand is not as steady as the hand trained in performing a skilled act, and this is not alone explained because of lack in training but may be accounted for by the fact that balanced action has not yet been established between the still progressing functional development of the cortex and the already perfected function of the older mechanisms That the cortex plays a part in the training of the normal as well as in the possibilities of controlling the hand of the spastic athetoid cannot be denied

We know that as man learned to use tools and his hands became the master, brain development and advances in civilization took place simultaneously In the majority of those handicapped from intracranial hemorrhage at birth, the backwardness can be accounted for by the lack in that process of development which proceeds by grasp and touch in every child When the hand is difficult to control an appreciable delay in the mental development of the child may result Just as the age of tools marked the first advance in brain development, so the birth injured must recapitulate the story and gain control over his hand The possibility of this recapitulation taking place depends upon the amount of undamaged cortex Unless there has been an injury to the cortical cells so gross as to cause idiocy the birth injured may be considered essentially as an individual who has little or no voluntary control

over his reflexes   As the injury is generally a diffuse one we seldom find a pure type of dyskinesia   There is a large amount of nervous energy spent in attempts to move a single muscle group and often the mere thought of moving a finger is sufficient to throw the entire body musculature into a chaos of writhing movements   As long as the factors of fear, self consciousness and anxiety are in abeyance the patient has no difficulty in making a normal coordinated movement   He must avoid too many sensory stimuli to which his nervous system has not yet been accustomed   The counterpart of this is seen in the normal person acquiring a skilled act   Until such a one becomes adept he will work with exaggerated tension and as a result the performance appears to him more difficult than it really is   To become adept in learning to play the piano, or violin, or to swim, regardless of what the intelligence of the person may be, it is necessary that he first adapt his motor centers to these specific exercises   Adaptation of the motor centers to these exercises by gradually and progressively coordinating impulses with muscular contractions until more and more harmonious relation is developed between conscious perception and volition, is very necessary   In other words, our capacity for skilled and accustomed muscular movements depends upon our memory of them and our power of recalling them and evoking them again

If the birth injured has only memories of his bizarre muscular movement it is obvious that he will lack correct kinesthetic sense and the method of developing a controlling kinesthetic sense rests in early conditioning

While considerable optimism in many cases of the birth injured is justified we must remember that we are never going to make a normal individual out of him any more than we can of the man with an amputated arm   Mentally, to be sure, he may far excel the ability of the latter, but unless he has learned to cope with the shortcomings which the absence of an arm imposes he is never going to become a happy individual   In a similar manner we cannot expect the man whose nervous system has a low threshold of irritability as a result of birth

injury to become as efficient as the normal. Then again we may find a mentality which exceeds the normal but unless such a person has learned the limitations which such a hyperactive nervous system imposes on him and has been taught to cope with his shortcomings he is not going to be happy. The solution of the problem of the birth injured is therefore far from being one solely of muscle training. Nothing is more pathetic than a child with a spastic arm or leg approaching adolescence who in spite of having had the best muscle training is rapidly becoming markedly introspective because of his inability to adjust to his handicap. In some instances the milder the physical affliction the more severe is the mental handicap. Fear and shyness exert an inhibitory influence on motor activity, and with the birth injured there is a constant conflict between the desire to correlate the movements and the inhibitory emotion. While it is true that the persistent conflict can be explained on an organic basis the patient is always the subject of more profound psychological difficulties. The afflicted frequently uses his handicap as a defense mechanism for the contemplation of reality. In school the teachers are lenient with him and should he not know the answer to a question asked of him it does not take much effort to appear more nervous than usual and thus invariably the teacher refuses to press him and takes it for granted that he knows the answer. If such a situation is not combatted with proper discipline in early life a difficult personality is bound to develop.

We are becoming more aware of the importance of vocational guidance and directed education of normal children in order that they may be equipped to enjoy a full life. This holds just as true for the birth injured who by properly equipped schools in addition to proper corrective motor education would be equipped to give their best performance at all times and would be given a background of experiences best adapted to enable them also to enjoy life by minimizing their handicap and emphasizing their best abilities.

CLINIC OF DR. A. S. BLUMGARTEN

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TREATMENT OF PITUITARY DISORDERS

THE recent progress in the physiology of the pituitary gland has placed the treatment of pituitary disorders on a rational basis

Pituitary disorders occur as definite syndromes or produce various metabolic, gynecological, or functional disturbances in other organs   The clinical syndromes of pituitary disease are fairly easy to recognize, but in order to treat them intelligently we must analyze the symptoms on the basis of the physiology of the pituitary and group them as manifestations of disturbed specific functions of the gland

Clinically, pituitary syndromes occur as dominant states of hyperfunction or hypofunction of various lobes or cellular elements in the pituitary gland   However, because of functional antagonisms or synergisms of various elements in the pituitary gland, many syndromes which are generally classified as hyperpituitarism of one group of cells are associated with manifestations of hypopituitarism of other cells and *vice versa* This is an important principle to recognize when treating pituitary disorders by means of organotherapy, as the basis of organotherapy is substitution therapy for hormone deficiency Thus we may check hyperfunction of certain cellular elements in the pituitary by supplying hormones for the associated hypofunction of the antagonistic cells when such hormone preparations are available and effective

It should be emphasized that the recognition of a pituitary disorder does not necessarily imply that it should be treated by

means of organotherapy   While this is the logical treatment
for pituitary deficiencies when possible, other forms of therapy
may be applied   The type of therapy used depends upon the
nature of the disorder and the kind of functional disturbance
which results   Consequently the methods of treatment may
be organotherapy, dietotherapy, surgical therapy, x-ray ther
apy, physiotherapy, or other methods of treatment according
to the indications

Organotherapy —Organotherapy is the logical form of
treatment for pituitary deficiencies   Essentially organotherapy
is substitution therapy   Consequently in order to obtain
results from the method of treatment it is essential to be able
to recognize the type of pituitary deficiency and to have prep-
arations available which are effective and whose potency can
be standardized

Physiological research has thus far established that groups
of different hormones are produced by the various lobes of the
pituitary gland   A problem for subsequent research to deter-
mine is whether these are separate hormones or whether some
of them are formed from other hormones   All the hormones
of the pituitary have not yet been isolated   At the present
time the following newer standardized preparations are
available

(A) **Anterior Lobe Preparations** —*Growth Hormone*—
Antuitrin G (Parke, Davis and Company), Anterior pituit-
ary Extract Squibb, Phyone (Wilson Laboratories)   These
preparations contain growth-stimulating hormones, probably
formed from the eosinophil cells, but they have not yet been
obtained in pure form and are as yet of limited value

Gonad-stimulating Hormones (Prolan Preparations) —
Antuitrin S (Parke, Davis and Company), Follutein (E R
Squibb and Company), Antophysin (Winthrop Company)
These are preparations prepared by the Aschheim-Zondek
method of extraction from the urine of pregnant women, or a
modification of this method   They contain gonad-stimulating
substances similar to those obtained from the basophil cells of
the anterior lobe of the pituitary, but they are not as effective

Preparations made from the urine of pregnant and menopause women approach in potency the gonad stimulating extracts prepared from the anterior lobe of the pituitary gland of animals

In addition, the anterior lobe of the pituitary gland has been shown to contain other hormones, but they have not yet been prepared for therapeutic use, nor have the indications for their use been established   The following hormones have been described

Prolactin, a hormone which stimulates lactation   There is some evidence indicating its clinical application as a galactogogue

A *thyrotropic hormone* which controls the function of the thyroid gland

A *parathyrotropic hormone* which influences parathyroid function

An *adrenotropic hormone* which influences the function of the adrenal gland

A *pancreatropic hormone* which influences carbohydrate metabolism by raising the blood sugar and antagonizing the effect of insulin

A *ketogenic hormone* which influences fat metabolism

(B) **Posterior Lobe Preparations** —The following preparations are available   Solution of Pituitary (Pituitrin) Pitocin Pitressin

Solution of pituitary (or *pituitrin*) stimulates the involuntary muscles of the intestines, contracts the uterus and the blood vessels raises blood pressure, it has an antidiuretic effect in diabetes insipidus and when it is given in large doses In small doses it is a diuretic   It also raises the blood sugar and antagonizes the effects of insulin

Pitocin when obtained in pure form acts only as an oxytocic.

Pitressin when obtained in pure form contracts involuntary muscles (as in the intestines) it is a vasoconstrictor, it produces an antidiuretic and a diuretic effect and it influences sugar metabolism

From a therapeutic standpoint progress has consisted
chiefly in determining the indications for the use of various
preparations   The exact dosage and frequency of administra
tion can only be determined when we are able to measure the
quantitative deficiency accurately   In some cases the quanti
tative determination of pituitary sex hormone and estrin in
the urine and blood has enabled us to establish an accurate
dosage for these preparations   This method, however, is only
possible for the endocrinologist equipped with a suitable animal
laboratory   In the majority of cases the dosage and frequency
of administration is determined largely by trial and error in
each condition

Dietotherapy —Some types of pituitary disorders are
essentially metabolic in nature   While hormone deficiency
may be the underlying cause, they are not amenable to hor
mone therapy   These cases can be treated favorably by
dietetic measures

The symptoms which are treated by dietary measures are
the pituitary obesity, the symptoms of diabetes insipidus, and
the separation of the epiphyses which sometimes occurs as a
complication of the Frohlich syndrome

Pituitary obesity has certain distinctive metabolic charac-
teristics which require special adjustments of the fats, carbo-
hydrates and proteins in the diet

In diabetes insipidus the salt and water content of the diet
must be modified

In separation of the epiphyses the calcium and fat-soluble
vitamin content of the diet must be adjusted

The specific diets indicated in each condition will be dis-
cussed under these disorders

Surgical Therapy —Surgery is indicated in two types of
pituitary disorders   (1) Pituitary tumors and neoplasms which
invade the pituitary fossa from neighboring structures, (2)
separation of the epiphysis of the femur

The operative treatment of pituitary neoplasms is a highly
specialized branch of brain surgery   Since this paper deals
only with medical treatment, we shall not discuss surgical

treatment except to indicate the method of treating the residual symptoms of pituitary deficiency which follow operative removal of the tumor and neighboring pituitary structures

The separation of the epiphysis of the femur requires orthopedic treatment in order to prevent deformity until organotherapy and dietetic treatment are effective in accelerating the closure of the epiphyses

r Ray Therapy —It has been definitely established that roentgen rays can modify the function of the endocrine glands Small doses stimulate, while large doses depress the function of a gland

Small doses are applied to stimulate the gonad stimulating hormones of the pituitary gland to induce menstruation Large doses are given to reduce the size of the pituitary neoplasms and thereby to relieve pressure symptoms, and to lessen overactive glandular function

The method of application is a highly specialized technic because the proper dosage is of prime importance It is beyond the scope of this paper to discuss it in detail

Physiotherapy —Several forms of physiotherapy have been used in the treatment of pituitary disorders, such as diathermy and red light, to stimulate pituitary function, but they are of very limited value

Therapeutic Classification of Pituitary Syndromes — From a therapeutic standpoint we may divide pituitary syndromes into the following groups

    I Clinical syndromes
        (A) Hyperfunction syndromes
            1 Acromegaly
        (B) Hypofunction syndrome
            1 Simmond s disease
              Pituitary dwarfism and infantilism
            3 Fröhlich's syndrome or adiposo genital dystrophy
            4 Diabetes insipidus
        (C) Pituitary basophilism
        (D) Bulbar disorders
        (E) Pituitary neoplasms
    II Metabolic disorders due to disturbed function, for example
        (A) Pituitary obesity

III Secondary gonadal insufficiencies
  (A) Male type
    1 Undescended testes
    2 Impotence
  (B) Female type
    1 Functional pituitary menstrual disorders
    2 Amenorrhea
    3 Oligomenorrhea
    4 Hypomenorrhea
    5 Menorrhagia
    6 Habitual abortions
    7 Sterility
IV Functional pituitary disorders
    1 Pituitary headache
    2 Other functional pituitary disorders

I CLASSICAL SYNDROMES
(A) HYPERFUNCTION SYNDROME

Acromegaly—The clinical symptoms of acromegaly are well known   The coarse, large features, the increase in the size of the hands and feet, are evidence of overactivity of the eosinophil cells of the anterior lobe of the pituitary   At the same time, however, there is usually evidence of deficient function of the basophil cells, indicated by amenorrhea in females and by impotence in males   These symptoms are often the outstanding complaints   In addition, the acromegalic patients often suffers from lack of energy, drowsiness, and a boring bitemporal headache which localizes the seat of the trouble

Acromegaly may be due to a tumor of the pituitary gland or develop without any apparent cause   When it is due to a tumor the usual signs of pressure on the optic chiasm or optic nerve are present   In some cases, however, chronic sinus infection may be of etiologic value

The treatment of acromegaly should begin with elimination of the causative factors   If a tumor is diagnosed, surgical treatment or x-ray treatment is indicated   If a tumor is not the cause, then infections in the sinuses should be looked for and treated

Before discussing the methods of treatment further it is essential to point out the following evidence which indicates that there is an antagonistic relationship between the growth-

stimulating hormones of the anterior lobe (probably derived from the eosinophil cells) and the gonad-stimulating hormones (probably derived from the basophil cells)

1 It is well known that as soon as puberty is established growth ceases In other words, the development of adult function of the gonadotropic hormones in the anterior lobe of the pituitary gland checks the function of the growth stimulating hormones

2 Cases of precocious puberty are generally of short stature due to retarded function of the eosinophil cells As a result the epiphyses close early and growth ceases

3 Eunuchoidism due to castration or other causes before puberty is associated with continued growth and delayed closure of the epiphyses

4 The administration of growth hormone to animals checks the sex stimulating effect of pituitary grafts

5 Evans has been able to change the growth stimulating hormone of the anterior lobe of the pituitary to a gonadotropic substance by injections of small doses of sex hormones

The treatment of the non neoplastic type of acromegaly has three objectives

1 To check the overactivity of the eosinophil cells of the anterior lobe of the pituitary

2 To overcome the symptoms of basophil insufficiency (the amenorrhea or impotence, lack of energy, etc)

3 To relieve the intense bitemporal headache

The overactivity of the growth-stimulating eosinophil cells in the anterior lobe of the pituitary may be checked by irradiation of the pituitary However we cannot localize the roentgen rays to the eosinophil cells alone, and since the acromegalic patient suffers from deficiency of gonad stimulating hormones which are also retarded by irradiation, I believe roentgen therapy is contraindicated

The evidence offered above indicates that the logical treatment for acromegaly is the sex stimulating hormone of the anterior pituitary gland The preparations which may be used are antuitrin S follutein antiphysin etc The exact dosage

cannot be determined because the degree of gonadotropic hor
mone deficiency cannot be measured   However, we begin with
doses of 100 rat units three times a week and increase up to
500 rat units or more   When menstruation is reestablished the
treatment should be stopped a week before the onset of the ex
pected menstruation   In male patients, however, if the im
potence is not relieved by these doses, the dosage may be in
creased still further   The point of tolerance is the occurrence
of headache   The efficacy of the treatment depends upon the
potency and the dosage of the preparation

We are treating a group of patients with acromegaly by
this method with most encouraging results   However, we can
not expect the acromegalic stigmata to disappear, but their
progress may be checked, especially if the patients are treated
early

The symptoms of gonadal insufficiency may be overcome
by injections of adequate doses of gonad-stimulating pituitary
preparations   In female patients each dose of antuitrin S or
follutein should be followed by a dose of an estrin preparation,
such as theelin   We have been able to bring about menstrua
tion in some of our cases of acromegaly who suffered with
amenorrhea by using pituitary sex-stimulating hormone prep-
arations in the doses described above

The intense boring headache, which is a very distressing
symptom in some cases of acromegaly, may be relieved tem-
porarily by a combination of various coal tar products, such
as amidopyrine, phenacetin, phenobarbital, etc , together with
sodium bicarbonate   However, since the headache is probably
due to pressure of the pituitary gland within the sella turcica,
because of increased physiological demands, efforts to relieve
it by means of organotherapy have been tried   The adminis
tration of gonad-stimulating pituitary preparations frequently
relieves the headache, but for this purpose smaller doses than
those necessary to stimulate the secondary gonadal insuffi
ciency may be used   However, in women we have found that
estrin preparations, such as theelin, are often more effective
than the pituitary sex-stimulating preparations

(B) Hypofunction Syndromes

1 **Simmond's disease** is a disease due to degeneration of the anterior lobe of the pituitary by infarction thrombosis or arteriosclerosis of the blood vessels in the pituitary or inflammation of the pituitary It is characterized by extreme cachexia, failure to retain salt and water, gonadal insufficiency, muscular weakness, and exhaustion It is more prevalent in women and may follow a pregnancy or occur as a terminal stage of acromegaly

Simmond's disease is a classical syndrome of hypofunction of the anterior lobe of the pituitary involving its growth and sex stimulating hormones as well as the other hormones in the anterior lobe of the pituitary Simmond's disease may be reproduced in animals by removing the anterior lobe of the pituitary gland

The treatment of Simmond's disease has one objective To provide adequate substitution therapy for the deficient anterior lobe because this is the cause of all the symptoms Consequently all the available hormone preparations of the anterior lobe should be administered in increasing doses Thus hypodermic or intramuscular injections of antuitrin S or follutein should be combined with growth hormone and the older antuitrin preparations The exact dosage cannot be stated because we cannot measure the degree of the deficiency We must, however, increase the dosage and frequency to the point of supplying the deficiency We arbitrarily begin with 100 rat units of antuitrin S or follutein and 1 cc of plain antuitrin At frequent intervals we also add growth hormone As a rule, we have obtained the best results from the combination of antuitrin S or follutein and plain antuitrin In addition, increasing doses of anterior pituitary should be given by mouth and the patient should be placed on a high-calorie high fat diet The ability to utilize these diets is increased by the administration of the hormones The results of treatment in Simmond's disease are however not altogether satisfactory

2 **Pituitary dwarfism and infantilism** are manifestation of a deficiency of both the growth and sex stimulating

hormones of the anterior lobe   Some of the cases are due to a chromophobe adenoma which, of course, indicates operative treatment

Dwarfism is characterized by failure of the skeleton to de velop to adult proportions and is usually associated, especially in the Lorrain-Levi type, with deficient gonadal development. When it is not due to a neoplasm, growth hormone should be given by hypodermic or intramuscular injections in increasing doses, beginning with 10 growth units every other day and increasing gradually   However, the results of treatment have not come up to our expectations, probably due to the fact that the preparations now available are impure or, as Collip has shown, there may be antigrowth hormones present which gradually retard the efficacy of the growth hormone   The experimental work of Riddle has also shown that prolactin and thyrotropic hormones of the anterior lobe of the pituitary accelerate the action of growth hormone   Clinical experience has also indicated that growth hormone is more effective when it is given in conjunction with thyroid extract   Consequently thyroid extract, beginning with ½ grain three times a day and increasing the dosage to the point of tolerance, should be given at the same time

The growth hormone is only indicated provided the epiph yses have not yet closed   However, the epiphyses remain open in some cases of dwarfism for longer periods than we would ex pect from the chronological age of the patient   Once the epiph yses are closed a change in growth is no longer possible and growth hormone is not indicated x-Ray examination of the epiphyses should, therefore, be made before beginning treat ment with growth hormone

The retarded genital development which is frequently asso ciated with cases of dwarfism and infantilism may be treated by frequent injections of pituitary sex hormone preparations, such as antuitrin S or follutein, beginning with 100 rat units two or three times a week and increasing the dosage, in addi tion to the growth hormone and thyroid extract

3 **Fröhlich syndrome** or adiposogenital dystrophy is

probably the most common type of pituitary deficiency met
with in practice   The classical syndrome shows adiposity with
a typical distribution of fat around the epigastrium, the lower
abdomen (in severe cases as a large apron of fat), around the
supra iliac region, and on the thighs   This is associated with
retarded development and hypofunction of the genitals   In
males the gonadal insufficiency occurs as faulty developed
genitals, and in mild cases as undescended testes   In females
the gonadal insufficiency occurs as menstrual irregularities
associated with particular kinds of menstrual symptoms

The classical Fröhlich syndrome is not as common as
various atypical forms in which there are variations in the
extent of the adiposity and the degree of gonadal insufficiency
Thus there are types of Fröhlich syndrome in which the
adiposity is the dominant feature, while the deficient gonadal
development is not very marked   On the other hand, the
gonadal insufficiency may be severe but the adiposity may be
slight. Frequently the Fröhlich syndrome is merely a con
stitutional manifestation which produces no symptoms   As a
rule, however, the objectives of treatment are to reduce the
obesity, to relieve the symptoms of gonadal insufficiency and
the headaches, and to treat the complications, such as the
separation of the epiphyses

Obesity.—The exact nature of the pituitary obesity has
not been definitely established   It is likely that a deficiency
of a ketogenic hormone is an etiologic factor   The obesity
may be treated by diet and by organotherapy   In our expe-
rience dietetic treatment is the best and most effective method
The best diets, however, are those which are adjusted to the
metabolic peculiarities of pituitary obesity   Essentially these
are an increased sugar tolerance, a lowered specific dynamic
action of proteins, and a tendency to hypercholesterinemia
On this basis we have found subsistence diets of about
1000 calories to be very effective   We use two types of diets

1   High carbohydrate, low fat diet which satisfies the car
bohydrate cravings of these patients and reduces their cho-
lesterinemia

2 High-protein diet which stimulates metabolism

Organotherapy—Anterior lobe pituitary extracts are the substances indicated for the obesity, but they are not very effective When the basal metabolism is low, thyroid extract in sufficient dosage will reduce the obesity The dosage depends upon the basal metabolic rate The lower the rate, the greater is the initial dose As a rule, we begin with 2 grains three times daily and increase to 5 to 10 grains three times daily to the point of tolerance In cases where the basal metabolic rate is normal, we begin with small doses of thyroid and increase very gradually The thyroid should be stopped when tachycardia, nervousness, sleeplessness, or a rise in systolic blood pressure develops Frequently, however, a feeling of exhaustion develops before these symptoms occur and this also indicates that the thyroid should be stopped

Desiccated pituitary extract, beginning with 1 grain three times daily and increasing to 20 to 30 grains three times daily, is often given together with thyroid extract The combination of thyroid and pituitary seems to be a more effective metabolic stimulant in pituitary obesity than thyroid alone

Dinitrophenol and dinitrocresol are sometimes used as metabolic stimulants, but in view of the large number of cases in whom toxic symptoms have developed, they should be given very carefully in small subminimal doses, such as $\frac{1}{20}$ grain or less daily for one to ten weeks, and the icteric index of the blood should be determined frequently during the administration If the slightest toxic symptoms develop or the icteric index rises, the drug should be promptly stopped

Secondary Hypogonadism—The faulty development of the genitals occurs in males as small rudimentary testes and penis, and in mild cases as undescended testes Their development can be markedly accelerated and the undescended testes may be brought down by frequent intramuscular or hypodermic injections of large doses of sex-stimulating hormones, such as antuitrin S or follutein, beginning with 100 units three times a week and gradually increasing the dosage The treatment should be continued for four to six months or longer

Impotence or infertility with or without spermatogenesis is treated by similar preparations. It sometimes improves when the weight is reduced even without administration of gonad-stimulating hormones.

In females the gonadal insufficiency occurs either as genital hypoplasia with failure to ovulate, or as amenorrhea, oligomenorrhea, or hypomenorrhea due to insufficient production of gonad stimulating hormones in the anterior lobe (prolan A and prolan B). This is treated by pituitary sex hormone preparations.

The gonadotropic hormones as contained in antuitrin S and follutein are given by intramuscular or subcutaneous injections. They should be given in doses of 50 to 200 rat units every other day combined with theelin during the first two weeks after menstruation. The antuitrin S or follutein is then given for the first two weeks after menstruation and the theelin is stopped. In some cases the failure to respond to the injections is due to hypoplasia of the uterus and the hypoplastic uterus cannot then respond to theelin stimulation. In these cases growth hormone should be added to the treatment to stimulate the development of the uterus.

Sterility due to pituitary insufficiency is treated in the same manner.

Irradiation of the pituitary has also been advocated to stimulate menstruation.

Some patients with Fröhlich syndrome suffer from menorrhagia. This may be treated by intramuscular or hypodermic injections of antuitrin S or follutein which is given for four to five days before the expected menstrual period. The exact mode of action is not known, but it is believed to be due to the effect of prolan B which it contains and which stimulates the formation of progestin.

Habitual abortion is a condition which sometimes occurs in pituitary disorders and it is believed to be due to insufficient production of progestin. In the pituitary cases the assumption is that it is due to insufficient production of prolan B. These cases are treated with injections of antuitrin S or follutein be-

cause these preparations contain some prolan B which stimu
lates the secretion of progestin

Separation of the Epiphyses —The retarded gonadal devel
opment which is a manifestation of the Frohlich syndrome re
tards the closure of the epiphyses   Occasionally the excess
weight separates the epiphysis of the femur from the shaft
and causes a painful deformity with varus of the affected lower
extremity   This condition should be treated by combined
orthopedic and endocrine methods   The patient is confined to
bed, a plaster cast is applied to the abducted extremity and
kept in this position until the affected epiphysis is united to
the shaft   At the same time the adiposity and gonadal insuf
ficiency are treated in the manner described, but in addition
viosterol and calcium preparations are added to the diet to
facilitate the closure of the epiphyses

4 **Diabetes Insipidus** —This is generally considered to
be a disorder of the posterior lobe of the pituitary   The work
of Zondek indicates the pars intermedia to be affected   Some
cases are believed to be due to destruction or other disorder of
a center in the hypothalamus which regulates salt and water
metabolism   Clinically two distinct types may be recognized
according to the chloride content of the blood   One type has
an increased chloride content of the blood and a low chloride
content of the urine   A more uncommon type is associated with
low blood chlorides and excessive chloride excretion in the
urine   A lesion of the nervous system, especially syphilis,
should be eliminated before treatment is begun

The first type of case is treated by pituitrin or pitressin
and a salt-free, low-protein, high-carbohydrate diet   The pit
uitrin is given by nasal drops in doses of 3 to 15 minims, by
a nasal spray, or it is applied with a nasal tampon   Powdered
pituitrin, insufflated in the nose, is also used   The severe
cases require hypodermic injections of pituitrin in doses of 10
to 15 minims, or pitressin in smaller doses, twice a day, and an
other similar dose before going to bed   The limit of pituitrin
or pitressin dosage is the development of abdominal cramps
and headache   Sedatives, such as luminal (phenobarbital), in

doses of $\frac{1}{4}$ to $\frac{1}{2}$ grain two or three times a day and bromides are very useful in relieving the frequency of urination

The more uncommon forms of diabetes insipidus are treated by restriction of water, a high protein diet, and by atropine in doses of $\frac{1}{100}$ to $\frac{1}{100}$ grain three times daily   Theobromine and theocin, in doses of 5 to 15 grains, or salyrgan or novasurol, by intramuscular or intravenous injection, are useful in many of these cases   Pitressin or pituitrin are not so effective in these cases

Intermedin, a preparation obtained by Zondek from the pars intermedia, and aquamedin, a similar substance prepared by Ferguson, have been reported to be more effective than pituitrin or pitressin and are indicated in refractory cases, but they are not yet commercially available

Some cases are benefited by lumbar punctures, and when syphilis is a cause, by antiluetic treatment

(C) PITUITARY BASOPHILISM

This condition, characterized by hirsutism in the female, by absence of facial hair in the male, and hypertension, striae, obesity, kyphosis and changes in the bones, has created considerable discussion   A differential diagnosis between this condition and adrenal or cortical tumor is extremely difficult to make   Some of the cases have been due to basophilic adenoma of the anterior lobe of the pituitary and have been operated   In the non neoplastic type the retarded secondary sex characteristics have suggested the use of gonadotropic pituitary hormones

(D) BILOBAR DISORDERS

Pituitary disorders may occur which cannot be grouped in any of the syndromes described   They have some symptoms which indicate disturbed function of the anterior lobe or only some of its cellular elements and other symptoms which indicate posterior lobe involvement   Thus gonadal disturbances may occur with evidence of diabetes insipidus, adiposity with diabetes insipidus, acromegalic manifestation with adiposity, etc   These disorders should be treated according

to the symptoms along the lines previously outlined for disturbed function of the various lobes of the pituitary

(E) PITUITARY NEOPLASMS

The treatment of pituitary neoplasms is beyond the scope of this paper because this condition should be treated either by surgery or by irradiation   However, the removal or irradiation of the tumor is frequently followed by symptoms of gonadal insufficiency because some anterior pituitary tissue may have been destroyed by the growth of the tumor, by a hemorrhage into the anterior pituitary or sella turcica, or by the irradiation   Consequently substitution therapy with gonadotropic pituitary substances may be used in the adult, and growth hormones in children according to the indications

II. METABOLIC DISORDERS

(A) PITUITARY OBESITY

Many metabolic disorders have an endocrine basis   The most common metabolic conditions in which the pituitary gland plays an important rôle are pituitary obesity and disturbances in salt and water metabolism

The treatment of this type of obesity is the same as the obesity of the Frohlich syndrome, whether it is associated with genital disorders or not

The treatment of disorders in salt and water metabolism on an endocrine basis is the same as that of diabetes insipidus

III. SECONDARY GONADAL INSUFFICIENCIES

Male Type —Gonadal insufficiencies in the male resulting from primary disturbance in the anterior lobe of the pituitary gland occur as retarded development of the male genitals, such as undescended testes   This commonly occurs in children and is usually part of a classical or atypical type of the Frohlich syndrome   The treatment of this condition has already been described under the Frohlich syndrome

In adults impotence or infertility, with or without faulty spermatogenesis, may be due to any type of pituitary disorder, even with acromegaly   The treatment of this condition

has already been described under acromegaly and the adiposo-
genital dystrophy

Female Type—The gonadal insufficiencies due to pitu
itary causes in the female occur as functional menstrual dis
orders (such as amenorrhea, oligomenorrhea, hypomenorrhea,
or menorrhagia), habitual abortions, or sterility While these
conditions generally occur in the Frohlich syndrome, they can
also occur in acromegaly or other pituitary syndromes when
the basophil elements of the anterior lobe of the pituitary are
involved The treatment of these conditions has already been
described under the Frohlich syndrome and acromegaly

IV FUNCTIONAL PITUITARY DISORDERS

Pituitary Headache—Headaches are of common occur
rence in pituitary disorders They occur especially in tumors,
in acromegaly, and in the Frohlich syndrome. All periodic
headaches, especially of the migraine type, are frequently
diagnosed as pituitary headache However, a pituitary type
of headache usually has definite characteristics It is felt
especially in the temporal region or the supraorbital region
It is usually associated with nausea and vomiting and fre
quently with blurring of vision When it is due to a tumor it
is usually constant and progressive When a tumor is not the
cause it is usually premenstrual or postmenstrual and is often
followed by abdominal cramps It usually disappears during
menstruation and in pregnancy It is associated with consti
tutional stigmata of pituitary disease However a similar
type of headache is often caused by uterine fibroids and oc
curs in some cases of migraine

Pituitary headaches have been explained by the following
mechanisms

1 It may be due to the pressure of an enlarged pituitary
gland within the sella turcica as is the case in tumors

2 It may be due to premenstrual and menopause swelling
of the pituitary within the sella turcica

3 It may be due to increased intracranial pressure with
consequent retention of fluid within the skull This i a p

ciated with overactivity of the anterior lobe of the pituitary gland, and as a result anterior pituitary hormone is excreted in the urine just before the attack

4 It may be due to a disturbance in the function of the autonomic nervous system producing a localized vasomotor disturbance resulting in localized angioneurotic edema

Pituitary headache may be relieved temporarily by coal tar preparations and sedatives, like all other headaches   However, as etiological treatment and to prevent their occurrence, dietetic and organotherapeutic methods are used   The limita tion of fluid and chloride intake has been tried   Injections of theelin, in doses of 100 to 200 rat units two or three times a week, have been beneficial in relieving the pituitary headache associated with oligomenorrhea or hypomenorrhea when it is due to pituitary factors

Antuitrin S or follutein injections, in doses of 200 to 500 rat units two or three times a week, has relieved the headache of acromegaly when it was not due to tumor

Ergotamine tartrate or gynergen, in doses of $\frac{1}{120}$ to $\frac{1}{60}$ grain once or twice a day, or a daily hypodermic injection of $\frac{1}{4}$ to $\frac{1}{2}$ cc or 1 cc , have been found useful in some types of pituitary headache because of their action on the autonomic nervous system

Other Functional Pituitary Disorders —Recent physiologic studies indicate that the pituitary gland controls a variety of functions   Consequently numerous functional disorders (personality problems, gastro-intestinal disorders, etc) other than those described may be due to pituitary dysfunction, but it would carry us too far afield to discuss them here   However, their pituitary basis may be determined by careful clinical and laboratory studies   Treatment based upon the principles outlined in this paper may be tried in many of these conditions

SUMMARY

1 The treatment of pituitary disorders by organotherapy, diet, surgery, or irradiation is presented on the basis of the newer knowledge of the physiology of the pituitary gland

2 Organotherapy is stressed as substitution therapy and the problem in its use to determine the deficiency and develop effective preparations is emphasized

3 A rational treatment of the aneoplastic classical pituitary syndromes is presented

4 The treatment of pituitary disorders should be based on the type of functional disturbances manifested

5 Similar functional pituitary disorders may occur in different syndromes and require the same treatment

6 The indications and uses for the newer hormone preparations in the classical pituitary syndromes and in various types of functional pituitary disturbances are described

CLINIC OF DR BURRILL B CROHN

Mt Sinai Hospital

PSYCHIC EFFECT OF ABDOMINAL TRAUMA

The practice of a gastro-enterologist, or better, of an internist who specializes in gastro-enterology, is in large part derived from nervous or functional cases   For every instance of organic pathological disease, be it ulcer, cancer or colitis, there are approximately seven or eight individuals suffering from functional complaints   Many of these are secretory or motor disorientation of function, but many are also pure neuroses, timid, frightened, anxious persons dreading disease and disability, or introspective instances of anxiety neuroses with somatic substitutions

It has so often been noted that these persons of unstable psyche who develop neuroses later in adult life have not always shown symptoms of emotional or psychic instability   In fact, most of them pass through school age and adolescence as 100 per cent efficient and self reliant individuals

A psychic trauma occurs in early adult life usually in the third or fourth decade—a death in a near and beloved relative, threatening sickness in a child or parent, financial reverses, the emotional disharmony of a discordant family life and the patient passes out of the harbor of calm waters into the wind stressed open sea perhaps some day to regain calm and equilibrium, perhaps and often not, but to remain through life tossed and buffeted by emotional and psychic instability

How much greater then is the likelihood of the development of a well-organized neurotic disturbance when that trauma is physical as well as psychic, when the serious life threat of a stab or bullet wound of the abdomen, with its pro-

longed, enervating convalescence, is superimposed and added to the fright and the shock of an assailant

Today I see a woman who survived three bullet wounds at the hands of a burglar and who has never suffered mentally or psychically from the shock, a survivor years after the Titanic disaster, who lost her father in that catastrophe, a survivor of the Morro Castle fire, innumerable front-line infantry veterans of the war, with stable nervous systems who have outlived and lived down major trauma, physical and psychic, without sequelae

On the other hand, one sees the civilian life derelict who could not weather an anxiety, who could not successfully overcome a grief or a shake-up without becoming an instance of a neurosis or hysteria Is the accident or injury in these latter persons the cause of the time-related, so-called "traumatic neurasthenia," or is the accident, the gunshot wound or the fall just the equivalent of the milder "shock-worry anxiety" incident that sets off the neurosis in a hitherto supposedly stable individual?

If the psychoneurosis results from the strain of a family illness, unemployment or financial stringency and the neurotic becomes unable to work and a confirmed "neurasthenic" invalid (psychoneurosis), no one is sued, no one claims relief from Workmen's Compensation or legal agencies The responsibility is the patient's, it is his unstable, nervous system that is basically at fault, his the odium, his the responsibility

But, if an industrial trauma or an accident occur, even though there exist no organic sequelae to that accident and physical health be restored, let an anxiety neurosis or an hysteria be thus precipitated and for the duration of that man's life he becomes a victim of "traumatic neurasthenia " As such, he is assumed to be an object of anxiety, he expects and obtains sympathy, most courts and nearly all juries liberally reimburse him from the pockets of impersonal insurance companies or from the working capital of struggling middle-class business men, or the budget-imbalanced municipality or state gives, or is forced to give, support for life

The existence of traumatic "neurasthenia" traumatic neurosis or hysteria as a clinical condition has not ever been questioned, but the relationship of the neurosis to the accident, whether it be merely a sequence of events in time or whether it be cause and effect, that question is, and always has been, moot in medical minds. To the better trained lights of the legal profession and its antiquated foster child, the jury of twelve, the subject, in the past, seems to have offered less of a problem.

The three case histories to be cited are instances in kind of this type of problem. While my training as a professional psychoneurologist is very meager, my experience with life, with human reactions and with neurotic and hysterical patients is fairly advanced. The opinions are essentially my own. The case histories are much abbreviated, only essential facts being given. The names of patients or of other physicians who participated are omitted for obvious reasons.

Case I.—An unmarried female of twenty five years of age always previously well and completely devoid of illnesses or complaints, accidentally swallowed fragments of glass in a restaurant while eating a portion of rice pudding. Two pieces of broken glass were removed immediately from the pharynx, a third particle was swallowed. Immediately thereafter blood was expectorated and vomited, the patient complained of severe pain upon swallowing and of constant substernal pain of a sharp or cutting character. The pain, the vomiting and expectoration of blood lasted for one week and was accompanied by black stools and actually by the passage per rectum of bloody mucus.

At this point, when I first saw her a radiographic examination was obviously indicated even though it was understood that glass is translucent to light and to the x ray and therefore could not appear positively as a defect shadow. Radiography (barium meal) nevertheless disclosed an irregular quadrangular defect about 1 mm in breadth and length lodged at the junction of the upper and middle thirds of the esophagus and just above the arch of the aorta. The shadow of the foreign body caused by the displacement of the barium mixture was seen on several plates. To confirm the finding and remove all doubt the radiographic meal was repeated the next day with identical findings.

Esophagoscopy was unfortunately delayed for twenty four hours. When performed it showed a laceration of the esophageal mucosa above the cardia but no foreign body was seen.

While convalescing from the procedure the patient not only developed a night chill at the time of temperature, severe pain in the left chest, a localized

quadrant, cramps which later eventuated in the complaint of severe and excruciating pain low down over the area of the sigmoid   A threatened per foration of the colon was suspected   The barium enema failed to give evi dence of a foreign body   After all, a negative shadow of a transluceat fragment of glass was hardly to be expected to show in the dense mass of barium clysma, or for that matter, even after evacuation of the enema or after air insufflation

The symptoms were apparently so urgent, the exquisite tenderness over the sigmoid so localized, that laparotomy was performed in the hope of re claiming the elusive piece of glass   The abdominal section failed to locate the foreign body, colon and sigmoid were palpated throughout, but no glass could be felt   There was no evidence of perforation or of perisigmoiditis   Rather than open the colon (colotomy), it was felt far safer to depend on the passage of the glass by the natural passages

Though the glass was never seen, the patient left the hospital after three weeks, apparently well

After a few weeks, however, she began to show signs of nervousness, in somnia, apprehension   She was completely emotionally unbalanced, cried on slight provocation and was fretful and irritable   She developed a coarse tremor of the hands and a shaky voice   She had lost, and continued to lose weight on account of the operative manipulations, restrictions in diet and nervous loss of appetite   She had become introspective, lived constantly in fear of a perforated intestine and complained steadily of vague abdominal pains of inconstant and inconsistent character

A transfer to the country air and general supportive and sedative meas ures failed to give relief   An amenorrhea of eight months only intensified the nervous symptoms   About this time, she developed in addition a true hemi anesthesia of the face, trunk, left arm and left leg accompanied by corneal and conjunctival anesthesia   There were many emotional outbursts, occa sionally with suicidal threats, hardly of a serious nature

The symptoms continued up to and throughout the weeks of legal trial for compensation of the injury   The patient made a steady, truthful and con trolled witness   A liberal verdict was awarded by a liberal jury

Within a few weeks of the cessation of the legal proceedings, the patient was restored to full health, normal sleep was resumed, the loss of weight was regained, the symptoms of hysteria, of vague abdominal pains, the symp toms of hemi-anesthesia and the corneal anesthesia slowly regressed and the individual was restored to normal health

Comment —The case was of interest in presenting the problem of finding an elusive bit of transparent glass as it passed through the esophagus and finally lodged in that so frequent resting place of foreign bodies, the sigmoid   The radiographic difficulties were again interesting and instructive

The development of a state of intense nervousness, in somnia, amenorrhea, and finally of true, though transient,

hysteria was a sequel of, and undoubtedly dependent on, the original trauma

Traumatic or posttraumatic hysterias are frequently of severe nature and may last throughout the patient's lifetime The favorable outcome of the case in this instance was based upon the fact that the patient had been essentially a well ordered, normally living person before the accident was free of other neurotic or sexual taints With the passing of the incidents related to and connected with the trauma aided by the award of the jury (though not caused by the award), the psychic and physical traumata were dissolved and a normal psychic equilibrium restored

To my mind, there was never any question of malingering nor one of a litigation complex This was an instance of true traumatic hysteria predicated upon a physical and psychical trauma in an otherwise normal girl With the removal of the traumatic sequelae, the hysteria resolved

Case II.—This is the history of a forty four year-old laborer who was at work in a shop five years ago when an air hose containing compressed air mischievously was inserted into his rectum The patient immediately col lapsed but regaining his strength was allowed to proceed home A delay of twenty four hours ensued at which time he was operated upon and three perforations of the sigmoid colon were sutured and a left inguinal tube colostomy established as a decompression measure against leakage and dis tention After a stormy convalescence covering six weeks he was discharged much improved

Subsequently the patient complained of generalized abdominal pain cramplike in nature occurring after meal There had been a progressive loss of weight amounting to 30 pound occasional vomiting loss of appetite and constipation

On two subsequent occasions he had been readmitted to the same institu tion for observation for these symptoms A diagnosis of periduodenal adhesions had been made on the first occasion but no operation was undertaken On the second readmission the diagnosis of periduodenal adhesions was entertained be cause of persistent duodenal cap deformity Such length rather than duodenal ulcer was favored as clear cut sign of a peptic ulcer were lacking

On physical examination five years after the original accident the patient was observed to be highly nervous though apparently well nourished and cooperative He complained in a querulous and petty and he had the appearance of a man in a state no better than his correct one He was weak miserable weighing 154 pounds He felt often tired That although miserable and in no special distress he never complained on a temperature of his pain in his abdomen from time to time

scars and a large ptosed right kidney, nothing of an abnormal nature was
observed   The extreme hypersensitiveness and stiffening of the abdominal
wall on palpation make any observations on epigastric tenderness or deep pal
pation unreliable

The sigmoidoscopic examination was completely negative, there was no
visible evidence of the previous sigmoidal injuries or repair sutures

An Ewald test meal showed a normal acidity (free acid 42 per cent, total
acidity 54 per cent, much mucus being present)   The Wassermann reaction
was negative

Hemoglobin was 75 per cent   There was no blood in the stool (grossly)
or by chemical tests (occult)

The radiographic and fluoroscopic examinations showed a normal alim
entary tract except for the inability properly to fill the duodenal bulb   On
many plates, the cap was seen to be distorted and spastic   On only one plate
did it seem to be properly filled out, though not completely or convincingly
No defect or penetration of the duodenal outline was seen

Comment —This patient had been subjected to a tre-
mendous physical and psychic trauma six years ago, as a result
of which his colon had been thrice lacerated and perforated,
requiring a major abdominal operation   Following the acci-
dent the patient had complained continuously, lost ground
steadily, with progressive weakness, anorexia and inanition

The interpretation of the distorted duodenal cap is difficult
The radiographer feels it to be spasm and duodenitis, which,
in the state of nervous hypertension and anxiety of the pa-
tient, is a very logical deduction, one which is supported by the
negative tests for occult blood in the feces   On the other hand,
the patient's complaint of postprandial pain and of night pain
makes one logically suspect the existence of a duodenal ulcer,
an ulcer which was not present at the time of the accident,
but one which has subsequently formed, either as an event
independent of the original trauma (not a true traumatic duo-
denal ulcer) or one which resulted from the psychic trauma of
he accident

There was little doubt in my mind but that this man was
eally unable to work   He was not malingering   He looked
ld, was weak, feeble, prematurely aged   Here was apparently
. bona fide case of so-called "traumatic neurasthenia," not
ysteria, not malingering or consciously exaggerated, but a real
ondition possibly allied to a traumatic or somatic neurosis

While I could not rule out the existence of a duodenal ulcer, I was strongly inclined to regard the duodenal deformity as spastic in nature and as part of a general hypersensitive, hypertonic visceral and cerebral nervous system The rather vague and continuous abdominal complaints, lacking periodicity, were more likely the visceral manifestations or reference of a psychic trauma superimposed upon a continual state of shock or asthenia, which had never been lifted from the time of the accident to the date of examination

The ultimate prognosis I considered to be poor, the persistence of the traumatic neurosis or neurasthenia was likely to be as permanent as the original injury had been severe Of the inability of the man to resume a gainful occupation I was convinced

Case III.—A man thirty-eight years of age was stabbed in the lower right abdominal quadrant seventeen years ago Immediate laparotomy resulted favorably and the patient remained well for seven years At that latter date while lifting a load he suffered from a sudden strangulated mesenteric hernia Again laparotomy was successful though a partial resection of the ileum was necessitated For four years he was able to do light work, but on being asked to do heavier work he complained of severe abdominal pains of indeterminate nature An exploratory laparotomy revealed "adhesions" only The pains in the left lower abdominal sector now became continuous disabling him from work causing a loss of 36 pounds and finally necessitating at this date a complete review of his case (seventeen years after the original accident)

The physical examination showed a thin highly neurotic suspicious individual of pallid complexion poorly nourished Three abdominal scars were present There was inconstant tenderness in the left para-umbilical and left costovertebral regions There were no other positive physical findings All laboratory data were negative including hematological and serological examinations urine feces and spinal fluid analyses The test meal was within the normal range of acidity

Gastro intestinal radiography failed to show any abnormalities The small intestine functioned normally

The psychiatrist felt that the patient was sensitive and fearful His sexual life had been very unsatisfactory since adolescence and because of this fact there had been many marital difficulties finally ending in estrangement and desertion on the part of the wife It was felt that this abnormal psychosexual situation should be given full consideration in the estimate of the patient's complaints

When the patient learned that the gastro intestinal x ray examination had been reported negative he insisted that he had "intestinal obstruction" and that the hospital was "trying to do him wrong" He refused to stay for a term of therapy and left the hospital against advice

Comment —It was obvious that this patient was suffering from a "psychoneurosis," that the residual psychic trauma resulting from his accident was translated into a somatic (intestinal) pain through a subconscious reflexion of his psyche The abdominal pain constituted a sublimation of this posttraumatic neurosis   To this state should be added a mild degree of malingering   The patient was most uncooperative, belligerent, refused to answer questions, refused to submit to examinations until coerced into doing so by threats of discipline, being resentful and suspicious

Before entering the hospital he had made up his mind that he had an obstruction in the intestine from the old stab wound, this constituted a fixed idea from which he never wavered and which, in this man, excluded all other possible interests

Discussion —We thus observe three cases of posttraumatic mental disequilibrium resulting either directly or some years after an accidental injury and creating a condition of physical disability and a complete loss of mental health   In the first case, a true characteristic hysteria, fortunately of temporary nature, occurred, in the second, one observes a traumatic neurasthenia or psychoneurosis based upon a very severe abdominal trauma and leaving over a physical and psychic wreck, a "shell-shocked" prostrated man who was unable to make a comeback   The third case illustrates the intensification of a sexual psychoneurosis as a posttrauma incident, with poorly disguised malingering and deliberate unwillingness and lack of cooperation in his period of medical observation

The degree of incapability and mental and physical and psychic disability resulting from accidents, particularly abdominal injuries, and resulting in the various forms of posttraumatic "neurasthenia" and "psychoneurosis" is a difficult one for physicians and for psychoneurologists to determine at any time   How much more difficult must it be for a lay jury or for the lay referee in a compensation court to determine since most of the referees in the workmen's compensation tribunals are lay, rather than medical arbitrators

The original accident may be trivial or it may be severe

Following recovery in the fortunate cases, there frequently ensues a posttraumatic psychic and mental disturbance, often of a psychoneurotic or hysterical type   Many, if not most, of these individuals are of the unstable psychic make up, who would probably anyway have buckled under as a result of life's disappointments and minor tragedies and are of the stuff of which neurotics are made   Shall the "accident" carry the onus for life of the psychoneurosis?   Such a view, if applied universally, would probably be unjust   On the other hand, the cessation of responsibility of the carrier or employer, when the result of the immediate accident has been treated and healed, may be equally unjust   An abdominal disease, such as duodenal ulcer, may not be caused by an accident, fall or injury, but if a preexisting disease is aggravated by a trauma the law and usage recognize the causal relationship and award damages and compensation at least to a degree

By similar reasoning, in appraising permanent damages in a posttraumatic neurosis, not only the accident itself, but the previous mental and psychic state of the individual calls for close consideration   Where a psychoneurotic background preexisted, or where an accident acts only as a precipitating factor in the development of a hysteria or somatic neurosis, the disability and responsibility should be divided between the injury and the psychotic predisposition of the patient

CLINIC OF DR MURRAY H BASS

Mt Sinai Hospital

PNEUMOCOCCUS PERITONITIS

WRITING in the Quarterly Journal of Medicine in 1910 an author begins a long article on pneumococcus peritonitis with the following words   "Pneumococcal peritonitis is a disease which appears to give rise to considerable differences of opinion as regards its clinical picture, its morbid anatomy the path by which infection occurs, and the best method of treatment to be adopted " Unfortunately a quarter of a century later, the same lack of definite knowledge concerning this disease still obtains   In the case of any disease about which there are still so many conflicting opinions it appears worth while to review the latest findings to see if any advances have been made in the study of its symptoms, pathogenesis and treatment

Pneumococcus peritonitis is a rather uncommon disease and one which requires keen judgment both on the part of the physician and the surgeon   It is therefore, I think, especially fitting that it should be the chief subject of discussion at a conjoined meeting of the surgical and pediatric sections

In attempting to present to you the present conception of pneumococcus peritonitis, I have reviewed the recent literature on the subject   I have also read carefully reports written some time ago, such as that of Rischbieth referred to above in the hope of seeing some advance in our knowledge   I have also collected all the cases occurring in the children admitted to Mt Sinai Hospital since 1921

Pneumococcus peritonitis is known as a disease entity since 1865 when Bozzolo described a case occurring in Turin Since then many series of cases have been published   Up to

1910 Rohr collected 192 published cases   Between 1910 and
1929 Schonenberger collected 280 cases   It is not a common
disease   At Mt Sinai Hospital the children's wards, both
surgical and medical, total about 100 beds   During the past
twelve years, in a fairly active service, only 19 cases are to be
found   Writing last year Barrington-Ward reported that
during the past fifteen years at the Great Ormonde St Hos
pital only 20 cases had been admitted   In a ten-year period in
Toronto, Duncan reported 34 cases   However, in Germany
the disease appears to be more common, for example Obadalek
reports 50 cases in a ten-year period in Brunn   In France
the disease appears to have been more frequent during the
early years of the century, then to have diminished in fre-
quency and now seems to be becoming more frequent

It is difficult to compare statistics since there are so many
different forms of the disease   For example, I have purposely
excluded all cases occurring in the course of nephrosis   Strictly
they should be included in this paper, but their clinical course
is so different that they really form a group by themselves

It is, of course, unnecessary to go into great detail as to
the symptomatology of pneumococcus peritonitis   The most
common picture is that of a young child who suddenly be-
comes extremely ill, complaining of very severe abdominal
pain, usually referred to the umbilical and lower quadrants
This is accompanied by vomiting, high fever, rapid pulse, and
at times diarrhea   Prostration becomes severe and the child
may go into collapse and die within twenty-four hours of the
onset   In other cases the disease drags on, the pain dimin
ishes, signs of fluid appear in the abdomen   Gradually there
are evidences of localization of pus in one part of the abdomen
and such an abscess may even rupture externally if not oper-
ated upon   Some cases go on for long periods undiagnosed and
may even be mistaken for tuberculous peritonitis

The complications that arise are such as are seen in any
cases of sepsis   Commonest is pneumonia   Otitis, endocar-
ditis, arthritis, etc may be found

Such a disease picture sounds simple enough yet there are

three important features connected with it which are hedged round with the greatest difficulties—its origin, its diagnosis, its treatment.

As to the origin of pneumococcus peritonitis we are certain of several important facts, first it is a disease affecting children in the first decade much more commonly than later on. Girls are affected more often than boys, the proportion being usually given as four to one. In my own series of 19 cases all were females. As to the portal of entry there are four main hypotheses. One, the disease is the result of a septicemia, and the peritoneal infection is secondary to the infected blood stream, second, the disease results from primary infection of the intestinal tract, third, the peritoneum is infected from the female genital organs through the vagina, fourth, it extends through the diaphragm from a primary pulmonary infection. Each of these routes of infection has its sponsors in the literature, and each author tries to make a case for one particular method of infection to the exclusion of all others. I think that when one has a series of such as mine in which in the 19 cases everyone is in a female child, one cannot but think that the genital path of infection must be an important one. However, the fact that typical cases do occur in boys proves that there must also be other portals. For the genital route the most important sponsor is J. L. McCartney. He pointed out that the disease is commonest among girls between three and seven years of age belonging to the poorest classes of the population. The disease occurs most often in the summer. He believes that lack of cleanliness and direct exposure of the genitals allows pneumococci to ascend the vagina and infect the peritoneum. He was able to isolate the germ from the vaginal discharge, and could reproduce the disease in monkeys by vaginal inoculation.

In some cases one can be quite certain that the throat is the portal of entry. In the series reported by Lipschutz and Rosenberg, 90 per cent began with a sore throat. In certain cases pneumococci have been obtained from the throat and the peritoneal exudate, but often the organisms were of dif-

ferent types   Van Dam reports a family of three children
where two had pneumonia and the third pneumococcic perit
onitis   Sims reports a father with a type I pneumonia, two
days later his daughter became sick with type I pneumococcus
peritonitis with a positive blood culture   A few days later
the nurse came down with type I peritonitis, both had positive
throat cultures, one developed localized peritonitis and the
other general

As for the transdiaphragmatic route, most authors agree
that this is very unlikely since one would have to predicate an
infection going contrary to the direction of the lymph stream

The infection from the gut would seem to be rather likely,
on account of the proximity of the gut to the peritoneum
Under the title of "Migratory Peritonitis," Wile and Saphir
bring forward evidence to show that the peritoneum may be
so infected   They describe a case of pneumococcus peritonitis
in a child, aged two, in which a peritoneal exudate and definite
enteritis was present   On account of the presence of diarrhea
as a symptom in the disease, attention has been focussed on
the intestine as a portal of entry   Long series of animal ex
periments have been performed (Obadalek) in which feces or
bacteria from children suffering from peritonitis have been fed
to guinea-pigs   Peritonitis in the pig has resulted   The
sponsors of the intestinal origin of the disease explain the fre-
quency of the disease in females by assuming that the stool
contains pneumococci which are then transferred into the
vagina thus causing vaginitis   In some cases of peritonitis the
first vaginal smear was negative while the second contained
pneumococci thus corroborating this hypothesis

From this brief review of the pathogenesis of pneumococcic
peritonitis it will be seen that there is no reason to suppose
that the path of infection in every case is the same   I can
see no adequate reason why the peritoneum cannot be in
volved as a part of the general sepsis, though this probably
does not occur often for, as Rolleston has shown, in the course
of pneumonia where blood infection is certainly common,
pneumococcus peritonitis is an extremely rare occurrence, only

11 cases having occurred in 4454 cases of pneumonia. Apparently the presence of pneumococci elsewhere in the body has some influence on their localization in the peritoneum. One might make an analogy here with streptococcus meningitis, which at times is part of a sepsis, at other is secondary to a neighboring infectious focus as the middle ear or the nasal sinuses.

In my own series of cases, one child was taken ill with severe abdominal pains, vomiting, and diarrhea and fever at the same time that his sister had an acute otitis media. One other case was admitted with a resolving left lower pneumonia. Except for these in none of my cases did symptoms point to any special portal of entry.

So much for the pathogenesis, now as to the diagnosis of the disease. When a virulent form of the disease is met with, the diagnosis ought not to be difficult. The rapid onset, the severe abdominal pain, prostration and diarrhea coupled with the physical findings of peritoneal irritation should arouse some suspicion especially in a girl during her first decade. The tenderness over the lower abdomen often on the right side makes the differential diagnosis between pneumococcus peritonitis and appendicitis very difficult. The differential diagnosis is, of course, of extreme importance on account of the question of operation. It is here that we have made progress by the introduction of peritoneal puncture.

This procedure was advocated by Denzer and by Neuhof and Cohen. The technic is simple. The skin over the site to be punctured is sterilized. A local anesthetic is used. A very small incision of the skin may be made with a scalpel, though this is not absolutely necessary. Through this incision a small size lumbar puncture needle is introduced with the stylet in place. One feels the resistance of the sheath of the rectus, passes through this and through the posterior sheath and so into the peritoneal cavity. The stylet is then withdrawn and a tightly fitting syringe is attached to the needle. Suction is made with the syringe and the needle is gradually withdrawn. Often there is only a drop of fluid obtainable and this just as

the needle is leaving the abdominal cavity   But even this minute amount of fluid may suffice to clinch the diagnosis When expelled on a slide and stained, the drop of fluid may contain organisms which may be identified under the microscope

For younger infants the instrument devised by Denzer is especially useful   This consists of a fine trocar (about the gauge of a small lumbar puncture needle), which is inserted into the abdomen   The stylet is withdrawn and replaced by a fine glass capillary tube   It has been shown that the capillary attraction in the glass tube being greater than in the metal needle, even in the presence of a very small amount of intra abdominal fluid, a positive puncture may be obtained

In a case where the pediatrician is in doubt as to the diag nosis, peritoneal puncture may settle the question   If a positive puncture is obtained and the fluid shows gram-negative bacilli or a mixture of several different organisms, the pus is the result of loss of continuity of the intestinal tract, and appendicitis is most likely   If, on the other hand, the puncture shows the presence of only gram-positive diplococci, one knows that one is dealing with either streptococcus or pneumococcus peritonitis   It is necessary to emphasize that a negative puncture does not necessarily exclude the presence of peritonitis, and that if other indications have led to the decision to operate, a negative puncture should not cause a change of opinion   However, should the puncture reveal gram-positive cocci alone, the odds are greatly against appendicitis, since as Neuhof and Cohen pointed out, in over 200 cases in which cultures were made of pus from a peritonitis secondary to appendicitis, in only two instances were there pure cultures of streptococci

Many authors consider puncture dangerous, but we have seen no untoward results   It would seem much more rational and a simpler procedure than that recommended by Loewe who advocated puncture through the vagina into the post-vaginal vault and thus into the peritoneum

Another diagnostic aid is blood culture   Its value, of

course, is lessened by the fact that twenty four hours are lost in awaiting its results In our series a positive blood culture was obtained in 4 cases, a negative in 7 cases while in 8 no culture was taken

The blood count is usually very high and yet there may be marked exceptions to this rule

In our series the white count ranged from 43,000 with 88 per cent polynuclear cells down The lowest count was 6400 cells with 74 per cent polynuclears in a child aged two and a half years who died after one week of illness

The treatment of this malady is fraught with great diffi culties Its treatment is surgical, but the great difficulty lies in knowing at what stage to operate It has been our pro cedure not to operate in the acute stage but to wait until the shock of onset has lessened and localization of the purulent process has taken place There are still many surgeons, how ever, who advocate immediate operation as soon as the diag nosis has been made, claiming that by means of drainage infectious material and bacteria are removed and the danger of absorption is lessened I believe the answer to this ques tion may be found by studying the natural history of this disease and classifying the results obtained in its various stages Many authors write about two types of pneumococcus perit onitis, the localized and the diffuse, as if they were entirely different varieties of illness I believe this to be incorrect, for though the disease may or may not involve the entire perit oneum It has a tendency to become localized This is nature's method of cure and it is at this juncture that the surgeon can assist in helping to evacuate localized secretion I had a chance to observe a case of pneumococcus peritonitis in a child suffer ing from nephrosis whose peritoneum was opened against my advice, with the idea that the child was suffering from acute appendicitis At operation there was free fluid in the perit oneum looking like dirty dish water The appendix was removed though it was not acutely inflamed The child went on to develop ascites and after a stormy period of several months showed signs of acute intestinal obstruction It was

operated upon, an obstruction was found, necessitating resec
tion of a large portion of small intestine At this time a huge
pelvic abscess was discovered and drained It contained at
least a pint of thick green pus giving a pure culture of pneu
mococcus This child finally recovered and interestingly
enough the nephrosis with its albuminuria has completely dis
appeared Here is a case operated upon early, surviving and
developing a localized abscess, reoperated on and recovering

The statistics collected by Schonenberger from all the cases
reported prior to 1929 are divided into the localized and the
diffuse cases He collected 158 cases of the localized form
with a mortality of 14 per cent, and 218 of the diffuse form
with a mortality of 87 6 per cent In other words only 12½
per cent of the children in whom localization failed to take
place recovered, whereas the figures in the group that localized
are exactly the reverse that is 86 per cent recovered If we
total the entire number of children reported we find that of
376 cases 162 or 42 per cent recovered, a mortality of 58 per
cent

In our own series of 19 cases 8 recovered and 11 died, a
mortality exactly the same, namely 58 per cent These fig-
ures would seem to point toward the fact that even with the
added advantages of a better knowledge of the diagnosis of
this disease, we have not been able to alter the mortality

I think that as soon as the disease is suspected vaginal
cultures and blood cultures should be taken and the organism
typed Serum if available should be administered All fluid
should be withheld by mouth and a continuous intravenous
drip of glucose should be started The surgeon should be
asked to see the case at onset and a peritoneal puncture should
be performed By supportive measures and serotherapy it
may be possible to tide the child over the vital shock of the
disease and when some sign of localization can be elicited
operation should be performed

I have tried to review briefly the latest findings referable
to pneumococcus peritonitis and have interspersed the statis
tics of others with our findings In conclusion I want to re

capitulate rapidly the findings in our own series. In the past twelve years 19 cases of pneumococcus peritonitis were treated at Mt Sinai Hospital. These were all in females ranging in age from sixteen months to ten years. Six were so sick when admitted that they were not operated upon. All of these died. In one case, an infant of sixteen months, there was spontaneous rupture with recovery. Twelve cases were operated on and of these 7 recovered. Blood cultures were taken in 12 cases of which 4 were positive. Vaginal cultures were positive in 7 cases. The duration of the disease varied from forty eight hours to several months. One case operated on fifteen hours after the onset recovered. All the other recoveries were in cases operated on several days after the onset. No cases not operated on recovered.

Pneumococcus peritonitis is therefore definitely a surgical disease and, as a pediatrician, after presenting the medical aspect I am glad to call in the surgeon and hear his viewpoint

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CLINIC OF DR MILTON L KRAMER

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PAROXYSMAL TACHYCARDIA   TREATMENT

PAROXYSMAL tachycardia is a sudden regular acceleration
of the heart rate, due to a rapid succession of ectopic beats
from a single focus in the heart The segment of heart serving
as focus lends its name to the particular tachycardia Auricular
paroxysmal tachycardia is the most common, occurring about
twenty five times more often than ventricular tachycardia
(White) Auriculoventricular nodal tachycardia is seen only
rarely, and when present, has the relatively unimportant sig
nificance of auricular paroxysmal tachycardia Gallavardin[1]
has further subdivided this group of tachycardias He dis
tinguishes a "Tachycardie paroxystique à centre excitable,"
where the attacks are precipitated by slight exertion or excite
ment These attacks too do not end suddenly and definitely,
but new short attacks follow one upon another until normal
rhythm is restored The rhythm may be disturbed then too
by extrasystoles originating at the same site as the preceding
disturbance He further distinguishes an ' Extrasystole a
paroxysmes tachycardiques," where the primary disturbance
is the appearance of extrasystoles, which become grouped and
produce a paroxysm of tachycardia Some cases show fre
quent alternation of extrasystoles and chains of extrasystoles
The latter group is usually of spontaneous onset and is diffi
cult to control

Definite pathological change related to this disturbance
of cardiac rhythm, have not been found as yet The lesion if
any, cannot be gross, since severe myocardial disease is seen
without paroxysmal tachycardia and cases of tachycardia with
fatal outcome may reveal no abnormality in the heart In
cases of heart significant changes and their site have to

been recognized As Wenckebach suggests, it depends more on a certain "state of the heart muscle or its nervous system," resulting probably in a decreased refractoriness of the muscle fibers (Lewis) A combination of influences appear to play a part, nervous (excitement, exertion, fatigue), endocrine (menstruation, pregnancy, thyroid disease), toxic (infectious and bacterial diseases, gastro-intestinal disturbances, nicotine, alcohol, caffeine, digitalis, strophanthin, adrenalin), and mechanical (high diaphragm) In association with heart disease, it is seen usually following rheumatic fever and disease of the coronary arteries It is important to point out here that paroxysmal auricular and ventricular tachycardia differ in their organic significance The former is usually not associated with organic heart disease, while the latter is generally but not always so related Hume[2] found no evidence of cardiovascular disease in 67 per cent of cases of supraventricular paroxysmal tachycardia, while Strauss[3] found that 80 per cent of patients with ventricular tachycardia had cardiac disease The tendency to attacks may become manifest through any, often the slightest, stimulus—as sudden movement, slight excitement or exertion, a distended abdomen, a painful gallbladder, etc. Very often, no obvious cause can be linked to an attack The attacks may occur at any age but their greatest incidence is in young adults

The paroxysms may last a few minutes, hours, days or even weeks The ventricular rate is usually 160 to 180, though occasional rates as low as 120 or as high as 200 or more are counted The effect of this rapid rate is to diminish the cardiac output In some cases no defects in the circulation are apparent, while in others, if the attack is prolonged or the heart muscle diseased, circulatory failure is precipitated The blood pressure may fall appreciably True angina pectoris may occur, due to the overwork of the myocardium and the relative deficiency of coronary blood flow, resulting from the short diastole and low blood pressure Cerebral symptoms, occasionally syncope, are the result of cerebral anemia

Proper diagnosis of this group of tachycardias demands exclusion of sinus tachycardia, auricular fibrillation and flutter If the heart rate at rest is fixed above 140 an essential abnormality of rhythm is usually present If the rhythm is normal, the rate rises in the erect posture, following exercise and the administration of amyl nitrite None of these procedures affects the rate in paroxysmal tachycardia Auricular fibrillation can usually be distinguished by its irregularity Auricular flutter may provoke difficulties Its rate is usually lower than that of paroxysmal tachycardia A long continued regular heart rate of 130 to 160 in a middle-aged or elderly patient should always suggest flutter Carotid sinus pressure may slow the rate for a few seconds and, on occasion such pressure or slight exercise may produce sudden, precise doubling of the heart rate, due to change in the degree of A V block It is often possible clinically to differentiate paroxysmal auricular tachycardia from the ventricular variety The former is absolutely regular,[4] the latter, although for the most part regular, will show slight interruptions, detectable by the ear[6] The intensity and quality of the first heart sound will vary too in different cycles, due to the varying relations between auricular and ventricular contraction The electrocardiogram, however, often is needed for absolute diagnosis

The treatment of paroxysmal tachycardia must be directed obviously at the individual attacks and at preventing their recurrence Experience has shown that there is no unfailing remedy for an attack (Lewis) Many methods and medicaments have been used, some having definite value Wenckebach mentions the following drugs as having been tried and then discarded—morphine, atropine, ether, camphor, amyl nitrite, nitroglycerine, bromide preparations, ergotine The approaches to therapy have been first those directed at stimulating the vagus and second those aiming at direct action on the heart muscle

In the former category probably fall the various procedures and positions that many patients themselves learn to use Bending far forward or backward, pressure on the ab-

domen, deep breathing, holding the breath, eructating, and vomiting are some   Deep breathing was utilized by such clinicians as Bamberger, Friedrich, and Nothnagel   The latter also advised drinking cold water   Apomorphine (1 cc of a 1 per cent solution hypodermically) or copper sulphate (4 cc. of a 1 per cent solution every five minutes by mouth) has been used to induce emesis   Schilder[6] reports very frequent cessation of attacks following use of these agents   Evacuation of the bowel or passage of flatus may help and thus give a clue for prophylaxis

Pressure over the carotid sinus (the expansion of the common carotid artery at and above its bifurcation) initiates a reflex whose efferent arc is the vagus   This procedure is excellent in stopping a paroxysm, but is uncertain even in the same patient   The effectiveness of the two sides often varies Usually, pressure on the right is more effective, but occasionally the left is more so   Cohn and Fraser[7] claimed that auricular tachycardia was better affected by pressure on the right, ventricular tachycardia, by pressure on the left   This has not been borne out, ventricular tachycardia rarely, if ever, responding to carotid sinus pressure[5]   The procedure is carried out by making firm pressure over the carotid artery below the angle of the jaw, sustaining the pressure for ten to forty five seconds   Although not always successful carotid sinus pressure should always be tried

Physostigmine and pilocarpine were used for their vagus stimulating properties, but have not proved their worth Wenckebach uses the former on rare occasions only, in cases of long duration, where quinine preparations have failed—0 5 to 1 5 mg daily

More recently, Starr[8] reported excellent results in the use of acetyl-B-methylcholin, in aborting paroxysms of the supraventricular type   No cases of ventricular origin were available for study   This substance is a vagal stimulant   Subcutaneous injection is followed promptly by flushing of the face and neck   After a few seconds a period of cardiac irregularity is followed by normal rhythm   The blood pressure usually

drops 10 to 20 mm   During the acute stage lasting two to
three minutes, respirations deepen, sweating and salivation
appear   These actions pass off within fifteen to twenty min
utes   If any attack did not stop promptly Starr massaged the
site of injection vigorously   If the attack still persisted, the
carotid sinuses were compressed alternately   The dose of
acetyl B methylcholin is 30 mg   or more subcutaneously,
starting with small doses, and giving larger doses if necessary,
as soon as the effects of the preceding injection have worn off
i e, fifteen minutes   The injection should be given with the
patient lying down   The presence of asthma is considered a
contraindication   Starr advises having a syringe ready con
taining atropine sulphate, 1 2 mg, to be used if distress is
marked

Of those substances which act directly on the heart   qui
nine preparations have proved most successful, irrespective of
the origin of the tachycardia   These preparations act by de-
creasing the irritability of the heart muscle and prolonging its
refractory period   Quinidine sulphate is used by mouth as
tablet or powder   A test dose of 0 2 Gm is given   If no toxic
effects appear, larger doses are given—0 4 Gm every two hours
for five doses during the day and repeated on as many subse-
quent days as are necessary   Intravenous injections of quini
dine sulphate—0 2 to 0 4 Gm every four hours for five doses
daily—have been recommended but it is simpler safer, and
probably as effective by mouth   Wenckebach employs qui
nine and urea hydrochloride intravenously if the attack is
more than four hours old and has not responded to simple
measures   He starts with doses of 0 2 to 0 3 Gm, increasing
these if without effect after three to four hours   Maximal doses
of 0 5 to 0 7 Gm are attained   The results obtained are excel
lent   The appearance of any toxic symptoms as tinnitus, dizzi
ness, diarrhea, nausea, vomiting, or urticaria definitely
contraindicates further use of these drug   Quinidine may be
used in the presence of cardiac disease   In fact, the indication
for its use would seem even more definite here, in order to
prevent the onset of circulatory failure   One should how

ever, avoid its use when evidence of heart block is present, for here at least theoretically it is contraindicated

Digitalis has not proved of much value in stopping attacks It should be used only in the presence of circulatory failure and then in the usual doses

Wolffe and Billet[9] reported favorably on the intravenous administration of calcium gluconate in bringing about cessation of attacks of auricular paroxysmal tachycardia Ten cc. of the 10 per cent solution are used

How then should the patient with paroxysmal tachycardia be treated? The mechanical and reflex nervous influences are especially in place at the onset of an attack when they are most likely to be effective Have him hold his breath, then try deep breathing, then pressure on the abdomen Carotid sinus pressure should then be tried, and if successful the patient should be taught this procedure to abort any subsequent paroxysms at their inception If the attack is severe the patient should be put to bed An ice bag to the precordium may make him more comfortable Diet should be reasonable, bowels kept regular Quinidine should be administered Sedatives as bromides or phenobarbital are indicated, or if distress is marked, morphine sulphate Hypnotics may be necessary for sleep If quinidine fails acetyl-B-methylcholin, calcium gluconate, apomorphine or physostigmine should be tried Digitalis and diuretics have their place in the presence of circulatory failure

Prophylaxis—Tobacco, tea and coffee are best reduced or eliminated Foci of infection should be eradicated from teeth, tonsils, sinuses, alimentary and urinary tracts Gastric and general abdominal distention should be eliminated, bowels regulated Healy[10] recently reported fewer attacks in 3 patients with alkaline urines, who were placed on high-fat diets Quinidine sulphate should also be employed in doses of 0 2 Gm twice or three time daily It may be given for months White recommends the use of digitalis, if quinidine is unsuccessful, advising doses of 0 1 Gm three times daily for a week, and then 0 1 Gm daily Acetyl-B-methylcholin is not of value in

prophylaxis since doses required by mouth lead to marked diarrhea Sedatives have a definite place in the prevention of paroxysms, as has reassurance of the patient which serves to remove much of the anxiety and fear of subsequent seizures

Levine[11] has attracted attention to the occurrence of paroxysmal ventricular tachycardia as a serious complication of coronary thrombosis He advises the use of 0 2 Gm of quinidine sulphate twice or three times daily for ten to fourteen days after an acute closure, to prevent the appearance of this rhythm and the dread ventricular fibrillation so often associated.

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CLINIC OF DR EVELYN HOLT

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ARTERIAL HYPOTENSION

At almost any clinic session there will appear at least one patient, usually a young woman, who in response to the first question, "What is your trouble?", will give as her chief complaint, "I have a low blood pressure" Her concern over this condition may make it impossible to elicit any definite symptoms—"Of course I can't feel well with this low blood pressure" or "They tell me I will never put on weight until my pressure is up"— or there may be a confusing multiplicity of complaints—fatigue, weak spells, headache, palpitation gas, constipation, menstrual irregularity, backache, insomnia and so on—the number of symptoms given being limited only by the number of questions asked Usually the physical examination is as unsatisfactory as the history, and although the examining doctor's association of ideas may be "low blood pressure—Addison's disease" or "low blood pressure—status lymphaticus" or "low blood pressure—postural hypotension," he may at the end of a careful examination find himself unable to make a satisfactory diagnosis The patient does not present the picture of postural hypotension or of any special disease, but does have a low blood pressure and has come to the clinic to seek relief The doctor is quite likely to advise the patient to have a blood count, a basal metabolism test or an x ray examination of the chest and to return at the end of the week, and to meet the requirements of the record room he must write a diagnosis on the chart 'Impression Hypotension' Impression Hypotension cause? focal infection or 'Impression No evidence of disease neurasthenia?'

The diagnosis of hypotension is not likely to satisfy the patient who indeed has brought this diagnosis to the clinic and who will probably ask several questions   What should my blood pressure be?   Why do I have a low blood pressure?   Is it serious?   What does it mean?   Nor should a diagnosis of arterial hypotension satisfy the doctor who may ask himself several questions   Has this patient a hypotension which is of clinical importance or is the relatively low blood pressure usual and normal for this individual?   Does this low blood pressure cause symptoms?   Has it a cause which can be determined?   Does the patient require medical treatment or should she be told that her low blood pressure is of no significance?

Hypotension is variously defined   Friedlander[1] considers the condition to be present when the systolic presure is less than 110 mm Hg but White[2] sets narrower limits and says that hypotension "is attended by a systolic pressure below 90 mm of mercury in an adult or by a marked fall from a previous hypertensive level"   Most of the patients who appear complaining of hypotension are found to have a systolic pressure of between 85 or 90 and 110 mm   It must be remembered that such pressures are relatively common, being found in from 2 5 to 3 5 per cent of healthy white adults and in practically all members of certain Oriental races, the Chinese for example (see Friedlander)

In the New York Hospital there are many young women with such low blood pressures   These young women are student and graduate nurses who are living strenuous lives, who are in good health and who have no circulatory symptoms, no tendency to become faint or dizzy, in fact who have no symptoms referable to their arterial hypotension   Many of them have unrelated physical defects such as chronic sinusitis, flat feet, acne, anemia or obesity   An attempt is made to correct these troubles but so far no nurse has received treatment in this hospital for her hypotension   This condition, while it is noted on the records, is not considered as a disease in itself, not even considered as evidence of an abnormal physical condition, but is looked upon as an individual peculiarity   In physical

findings these nurses are very similar to the patients who come to the clinic, but there is one important difference—the patients *feel* sick

In bed in this hospital are always patients who have a low blood pressure In these cases the hypotension is recognized as the result of some acute of chronic condition hemorrhage, shock, acute infectious disease, myocardial failure, severe anemia, or advanced tuberculosis—and the symptoms are those of the primary condition, not of the low blood pressure Although there are always patients with a low blood pressure no patient has been discharged from the New York Hospital with a primary diagnosis of arterial hypotension and no patient has been discharged from the medical service with hypotension listed even as a secondary diagnosis Indeed there are only 4 cases of hypotension listed as a secondary finding in the diagnostic file of the record room In studying the records of these 4 patients one finds that each had a rather low blood pressure, the highest systolic pressure recorded being 108 mm and the lowest 96 mm, but that no one of them had symptoms which might reasonably be attributed to the low level of the blood pressure In one case the patient, a woman of twenty four years, was admitted to the medical service where the low blood pressure was recorded and where the diagnosis of advanced pulmonary tuberculosis with cavitation was made, but the diagnosis of hypotension was not made until the patient was discharged from the surgical service after one phrenic nerve had been sectioned The other 3 patients, all women, were admitted directly to the surgical service because of some other condition It is interesting to note that the one of these patients whose pressure was lowest had had a nephrectomy performed seventeen years earlier and that in addition to a hypotension without symptoms she had a single kidney with but evidence of impaired renal function

When one considers the large number of persons who have hypotension and no symptoms one may well raise the question whether a low blood pressure *per se* ever causes symptoms Doubtless there are many persons who have a low blood pres

sure and who feel tired, listless and lacking in ambition but there is no good evidence to show that the low blood pressure causes the fatigue and listlessness, and there are certainly robust ond vigorous persons whose pressure is always low A person whose blood pressure has dropped from a higher to a lower level, as for example after an attack of coronary throm bosis, may have definite symptoms of weakness and prostra tion but it is not easy to prove that the symptoms are the result of the falling pressure   The best example of symptoms related to hypotension is seen in the rare but unusual cases of postural hypotension   Three such cases were studied in detail by Brad bury and Eggleston,[3] and in each case the most striking finding was a lack of the normal vasomotor tone and the mechanism for maintaining the normal blood pressure   Exercise or even standing erect caused an extreme drop in the blood pressure, to such levels as 40 mm systolic and 20 mm diastolic, and with this there was loss of consciousness   These patients com plained of syncopal attacks on standing or after exercise   In such cases the complaint is definite and bears a definite rela tion to the hypotension

It is often difficult to determine why the blood pressure is low   In the case of sick patients one may recognize the fact that the arterial hypotension is a symptom or result of some other condition, a disturbance of one or more of the factors which ordinarily maintain the blood pressure   There may be weakness of the heart muscle as in cases of coronary throm bosis or there may be a great decrease in the volume of the blood resulting from hemorrhage or excessive loss of body fluids   In states of shock there is a temporary hypotension resulting from decreased peripheral resistance which in turn is caused by the loss of vasomotor tone and stasis in the arte rioles and capillaries   Less striking but more permanent varia tions in vasomotor tone are probably of great importance in most, if not all, of the cases of hypotension, and it is probable that further studies of the arterioles and capillaries will add greatly to our understanding of all forms of hypotension   It is quite possible, however, that the chief value of such studies

will be the light they throw on the opposite condition, increased vascular tone and hypertension A number of writers recognize a condition of essential hypotension and I Friedlander[1] suggests that chronic poisoning with histamine with consequent loss of capillary tone may be the real cause of this condition As it is difficult to determine the state of the small vessels in most parts of the body, and as the tone of the vessels may be influenced by many factors—nervous stimuli drugs poisons, internal secretions—there remains a large unexplored territory and when we speak of decreased peripheral resistance we must admit that we really know very little about the exact physiology of this condition

Apparently hypotension is found in three groups of cases, (a) as one part of the clinical picture of certain diseases or conditions, (b) as an accidental finding in many perfectly healthy persons, and (c) as the only objective finding in certain persons who present a variety of complaints The last group is apparently the one which has been called essential hypotension, and a variety of theories as to its nature and cause have been expressed One may question whether it plays a part in producing symptoms, or whether it is not, like visceroptosis, a condition found in individuals of a certain bodily type, frequently asymptomatic but frequently blamed for many ills In view of the fact that the blood pressure in these cases is no lower than that found in many healthy persons, one must question its significance, and I think that one should hesitate before making a diagnosis of essential hypotension If the hypotension is the result of some underlying trouble it is not "essential" but secondary

There are a good many life insurance statistics which show that persons with a low blood pressure have a greater life expectancy than have others Symonds,[2] from a study of 150 419 cases came to the conclusion that a low blood pressure was favorable and Fisher[3] in a pamphlet issued by the North western Mutual Life Insurance Company stated that in the case of 3389 persons with a systolic pressure of less than 107 mm the mortality was only 35 per cent of that expected If

hypotension is a good prognostic sign from the standpoint of the insurance companies, is it really a bad sign from the standpoint of the patient? There seems to be a good deal of confusion on this subject and the patients seem to suffer from the confusion. The insurance statisticians may point to arterial hypotension as a favorable sign, but many of the insurance examiners view a low blood pressure with suspicion. I have a letter from one of the insurance companies which was brought to me a few days ago by a nurse who had just had an application for a new policy refused. There is a form letter calling attention to the abnormal conditions checked and urging the applicant to show the letter to his physician and to have the slighter manifestations of threatening diseases attended to in their earlier stages. The following threatening manifestations were noted.

Dental caries   Should have teeth x-rayed and cared for
Throat and nose abnormality   Slight thyroid enlargement.
General debility   Low blood pressure (96/62)
Remarks   Light weight, in need of general toning up

x-Ray films of the teeth show no evidence of abscess, there are a couple of small cavities to be filled, the mouth is in very good condition. The slight thyroid enlargement is very slight and has been present since puberty, there are no evidences of disturbed function of the gland. The blood pressure is always low, but there is no general debility. This applicant for insurance is a graduate nurse who has not been sick for years, who is doing hard work and who feels perfectly well. Has she an essential hypotension or a hypotension secondary to focal infection or to thyroid disturbance? She considers herself well but the insurance examiner considers that she requires treatment. The patients who come to the clinic consider themselves sick but the clinic doctors do not believe that they require treatment, at least not for their hypotension.

In view of the fact that a relatively low blood pressure is normal for many persons, one must doubt the propriety of explaining lack of physical vigor or any vague complaints on the basis of arterial hypotension, particularly when the blood

pressure is within the limits accepted as normal by numerous workers. Hypotension is not a disease but a sign and a sign which is often considered favorable rather than is unfavorable. Perhaps in many cases it is not important enough to be called a sign, but has received rather more attention than it deserves because it is so easily measured and expressed in terms of figures. In the course of sickness a falling blood pressure is often very important, but is important in that it is a part of the clinical picture, like a rising temperature a leukocytosis or a tachycardia. Although it is easy to record low blood pressure, it is not easy to understand the interplay of the various factors which are responsible for this condition. One can doubt the clinical importance of a low blood pressure in many cases, but one should not lose interest in studying arterial hypotension as a problem in physiology.

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CLINIC OF DR ARTHUR M MASTER

Mt Sinai Hospital

TREATMENT OF CORONARY THROMBOSIS AND ANGINA PECTORIS

On March 18, 1935,[1] there appeared in a magazine having a weekly circulation of more than 500,000, an article entitled "Angina Pectoris" From this article I quote the following "When a robust man suddenly drops dead and the newspapers report heart failure the probability is that he died during an attack of angina pectoris If he had gone to his doctor the day before, the doctor would probably have slapped him on the back and told him that his heart was as sound as a dollar" Further on, in the third paragraph, is stated 'The pain of angina pectoris is the most agonizing that a human being ever feels Many victims do die during their first attack of angina pectoris"

If conditions were really such as are here depicted there would be no point in writing this article This pessimistic view, however, does jibe with a common tenet of physicians that coronary artery thrombosis is an extremely serious disease and also parallels the notion possessed by the laity that angina pectoris is a hopelessly fatal condition These conclusions are entirely unwarranted It has been the experience of the writer that, nowadays individuals do not usually die in their first attack of coronary thrombosis and that follow up treatment is such that the patient is enabled to live a long useful life

In a recent investigation, it was shown that of 75 private patients who sustained 85 attacks of coronary artery thrombosis and were treated by the method herein described less than 2 per cent died in their first attack, and about 10 per cent

in the attack treated, no matter whether it was the first, second, third or fourth

At Mount Sinai Hospital, New York, where this treatment has been used during the past two years, results have been very good also, although the death rate has been somewhat higher than in the private cases   The mortality for all the attacks has been about 15 per cent and for the first attacks less than 10 per cent   These figures[2] are much lower than previously reported data and much lower, too, than the mortality rates observed at Mount Sinai Hospital in the five years previous to the institution of the specific treatment to be described   In the years 1929, 1930, 1931, 1932, and 1933 the mortality rate ranged from 34 to 57 per cent

The reports in the literature quote the mortality for coronary artery thrombosis at about 50 per cent   Levine,[3] in his monograph, gives 53 per cent mortality

Conner and Holt[4] were the first to differentiate between initial attacks of coronary thrombosis and subsequent ones   In a review of 287 cases of coronary thrombosis they found the mortality in the first attacks to be but 16 per cent, a figure considerably lower than any hitherto published   Howard[5] has recently reported 167 cases of coronary thrombosis in which he found a mortality of 24 per cent in first attacks   Hence, although in previous reports the mortality for coronary thrombosis is high, there is definite evidence that for the first attack at least it is now much lower   It is believed that by employing the procedures to be outlined here the mortality in this very common disease will be drastically reduced

The treatment described here is for coronary artery thrombosis and for the period following the acute illness, which is really the treatment for an anginal syndrome

The diagnosis of coronary artery thrombosis is usually a very easy one   The history of sudden, severe substernal pain, presence of grayish pallor, perspiration, rapid pulse, cold extremities and collapsed veins, apprehensive appearance of the patient, that is, signs of shock, development of a leukocytosis, rise in temperature, drop in blood pressure, inevitable change

in heart sounds, and possible presence of a pericardial rub, history of previous angina pectoris, pathognomonic electro-cardiographic changes all these in combination are character-istic of no other condition than acute coronary artery throm-bosis   When in doubt the patient should be treated as if he had sustained a coronary closure   Within two or three days the diagnosis will become certain   It sometimes requires two, three, or four days or longer before the blood pressure drops, or the temperature rises, or a diminution of heart sound in tensity occurs *

The patient is put to bed if he has not been found there Occasionally, one is called to see a person who sustained his accident at some place other than his home   If he is in shock when seen, the writer tries to keep him on the premises until the initial shock stage passes   Nursing help is obtained immediately

Morphine[7] is given liberally for the pain   For severe pain half a grain will be necessary, and frequently as much as a whole grain is required within the first twelve hours   For collapse, if the patient is critically ill, caffeine is given intra muscularly, but nitroglycerin, amyl nitrite, adrenalin and digitalis are contraindicated [7]   Very frequently the pain does not disappear within the first two days and then the patient is placed on codeine therapy, for example codeine sulphate ¼ or ½ grain is given every four hours   Once in a great while there appears to be an idiosyncrasy to this drug and in that case dilaudid (Bilhuber Knoll) ½ or ⅛ grain is substituted

* A word of caution must be said in regard to nausea and vomiting   These are just as characteristic of an attack of coronary thrombosis as they are of acute gallbladder, or gastric or kidney disease   They do not mean acute Indigestion"   The writer well remembers an incident that occurred in a ward of a New York hospital in the year 19 0 just after Herrick' had published his second paper on coronary thrombosis   An Italian laborer had been brought to the hospital in collapse and a tentative diagnosis of coronary thrombosis was made   However when nausea and vomiting continued for the next two days the diagnosis was changed to that of a gastric intestinal disturbance and the patient was discharged   He returned to work and died suddenly on the fifth day after the first collapse   Today this man likely would have been saved

While the patient is in shock, practically no food is given, of course, as in this stage of collapse there is no desire for food Sips of water are given for thirst and, unless there is excessive perspiration, the fluid intake is limited to 1200 cc per day It often happens that the patient receives very little food for three days If there is a wish for food, small quantities of strained vegetables, or apple sauce, or fermented milks, such as zoolak, fermillac, sour milk, buttermilk, etc are given If nausea or vomiting is present, bits of cracked ice or sips of cold charged waters, such as White Rock, or seltzer, are prescribed For these complaints absolute rest for the stomach is an object for which one must strive As the patient improves, tea, dry toast, and chicken are added The patient frequently describes which foods are nauseating to him and which are not Sodium bicarbonate or bismuth preparations overcome the nausea and vomiting, occasionally, but the avoidance of food is the most potent treatment for the complaints Bits of cracked ice may be of help The patient's diet is usually about 500 calories by the fifth day By the end of the week he is on an 800 calorie diet In many individuals who do well from the very start, an 800 calorie diet is instituted at once This diet is well balanced, consisting of 80 Gm of carbohydrate, 50 Gm of protein and 30 Gm of fat, and contains adequate vitamins Sufficient calcium is given through milk or its derivatives A very inexpensive diet following all these suggestions is one that we have been using at Mount Sinai Hospital and which was originated in the diet kitchen in charge of Miss Adeline Wood and Miss Ella Coleman

Breakfast	1 small serving fruit without sugar
	2 tablespoons cooked cereal
	1 glass milk, buttermilk or skim milk
	½ slice bread or toast.
	coffee or tea without sugar or cream
Dinner	1 cup broth, if desired
	2 ounces lean meat or fish or chicken
	½ cup vegetables
	1 small serving fruit without sugar
	½ slice bread
	coffee or tea without sugar or cream

Supper   1 ounce pot cheese or 1 egg
          ½ cup vegetables
          ½ slice bread
          1 glass milk, buttermilk or skim milk

The patient is put on an 800 calorie diet for six weeks during which time the fluids are limited to 1000 to 1500 cc a day. Condiments are not given as they increase the appetite. The food is not salt poor unless congestive failure is present. One might state here that, although these rules are followed in the vast majority of the cases, common sense indicates the quantity, quality and time of food and drink. Naturally if it is a warm day and the patient perspires he is given more fluid. If he is doing very well and is extremely hungry he may be put on a 1000 to 1500 calorie diet at the end of six weeks. There are many ways to overcome the sensation of hunger. Clear broth, jellied consommé, and tomato juice have very little food value yet may satisfy the hunger sensation. Instead of three meals a day, the patient is given four, five or six. He is cautioned to eat slowly and to chew his food very well. Gastro-intestinal disturbances do not occur when these precepts are followed.

Nursing care is extremely important, as the object is to prevent any exertion on the part of the patient. It is desired that the patient hibernate. He is to move about as little as possible, to talk little and to see few visitors. The nurses feed him and are really present to save his energy and to be prepared for an emergency. The nurse is cautioned not to do too much. The patient is simply to be kept quiet and comfortable.

The situation must be frankly described to the patient. He should be taken into the doctor's confidence but at the same time he must be assured that he will get well. The patient is told that his heart has sustained an injury and that rest and immobilization of the organ are essential. Unlike a broken leg it is impossible to completely immobilize a heart, but procedures may be followed to cause it to beat more slowly and not too vigorously nor against too high blood pressure, that is

measures are taken to diminish the work of the heart Such requirements are Absolute rest, both mental and physical, and partaking of as much food only as is absolutely necessary After the first twenty-four to forty-eight hours, when the patient sees real progress, he becomes more cheerful The severe pain is practically all gone in a day or two and in most cases under the treatment described in this paper it does not return at all during the entire illness

The treatment of a patient with coronary thrombosis requires attention to the smallest detail For example, if it is seen that there is friction between the patient and members of his household, it is explained to the former that he must avoid all aggravation because increasing the heart rate increases the work of the heart, and, furthermore, that dangerous reflex disturbances may occur The patient is told further that, no matter who is right, he will always be the loser whenever irritated If the patient's extremities feel cold, heat should be applied He must not be permitted to shave himself Visits from secretaries, business associates, relatives and friends should be discouraged throughout the first few weeks

The patient and his family are encouraged to ask questions of the physician, and frank answers are given

It is extremely important to avoid upper respiratory infections, as such might cause a relapse in the patient's condition Any infection[8] increases the heart rate, causes a drop in blood pressure, and unfavorably affects the cardiovascular system

It is considered that during the first few days of an attack enemata and cathartics are dangerous The patient's bowels are not moved and he never seems to be uncomfortable from the delay—this is probably true because of the small meals he receives By the third or fourth day a large enough dose of laxative is prescribed to cause an easy bowel movement Straining is dangerous If codeine, dilaudid, pantopon, morphine, etc have been given, no matter how small the dose, it will usually require three times the ordinary laxative dose to overcome the constipating effect of these drugs For example,

30 grains of cascara daily is not an unu... ...cription under these conditions

In the initial stages when the pat... ...hock, or cyanotic, or in severe pain, oxygen ther... ...t symptomatic help   Recently,[9] it has been int... ...oxygen is of great benefit in coronary closure case... ...many extremely ill patients survive without oxygen t... ...t practically every patient who dies will have receive... ...n of therapy   Hence, while I do not hesitate to use o... ...l in fact, prefer to use it when there is cyanosis or marked dyspnea, or when the oxygen relieves severe pain it is still to be proved that it has much effect on the course or outcome of the disease

The patient usually remains in bed until the sixth week [10] A few days before this time has elapsed he is permitted to sit up, then to hang his feet over the side of the bed and finally, he is out of bed for fifteen minutes in the morning   Progress is then slow but steady and by the eighth week the patient is walking around   By the twelfth week he is probably ready to climb stairs slowly   No set rules may be promulgated   The patient's symptoms and signs are watched very carefully and they are the guide posts to the procedure   For example, if there is a return of pain or pressure, choking in the neck, or shortness of breath on exertion, or if cyanosis appears it is evident that the patient is being pushed too rapidly   He may be returned to bed   On the other hand, there are a great many patients who make better progress and, therefore require less time for all the steps outlined

Patients return to work, usually, in from three to twelve months   Subsequent to the first episode of thrombosis the earlier period is more apt to be the fact whereas following the second or third closure, the latter   Some patients are disabled permanently   Following 85 attacks of coronary occlusion the patients were able to return to their usual work routine, after 53 attacks, to slight or moderate work after 15 attacks, and in 6 instances the patients remained completely disabled   Not one of these 6 patients was in bed

however   They even travel   In 6 cases the attacks have occurred within the last six months and it is, therefore, too early to decide as to their economic restitution   There were 8 deaths

Anginal Syndrome —The subsequent treatment of pa tients who survive an attack of coronary thrombosis is ex tremely important, for unless great care is taken a recurrence is probable   To prevent this, the therapy called for is really the treatment for an anginal syndrome   Here it must be said immediately that except for such drugs as nitroglycerin and the narcotics the drug treatment is of the least importance Evans and Hoyle[11] recently reported the results of a study of more than some 20 drugs in the treatment of patients with an gina pectoris and we have fully corroborated their findings in a special anginal syndrome clinic at Mount Sinai Hospital, New York   They used sodium nitrite, potassium iodide, luminal, chloral, diuretin, euphyllin, belladonna, digitalis, Iocarnol, hermol, etc   No drug, be it sedative, hypnotic, vasodilator, tis sue extract, diuretic or digitalis, had any effect other than psychologic   Of course, symptoms may be and should be alleviated but none of these drugs has a specific effect   Strange as it may seem, it is usually the first drug that has the greatest effect, for it is usually the control placebo   We do think, how ever, that when pain recurs the narcotics are of great benefit Furthermore, it is thought that these drugs, such as codeine, dilaudid, pantopon, morphine, etc are probably helpful be cause they retard the pulse, lower the basal metabolism, and diminish the work of the heart [12]   Their analgesic action helps, of course   Heberden[13] pointed this out in 1786   In spite of the expressed doubt concerning the benefit of drug therapy, the writer is very optimistic as to the favorable outlook follow ing the general treatment already outlined   He simply thinks that the drug factor is the least important part of the treatment

The patient must change his life routine to correspond to the limits of his myocardial reserve   He should remain in bed eight to ten hours at night even if he does not sleep the entire time   He should try to rest in the afternoon   In general he

must take things easily He should walk but avoid walking
uphill or against a wind, and, in short any exertion or
excitement that brings on symptoms of pain pain in the
chest, choking sensation in the throat of breath
palpitation or irregularities of the heart fingertips,
edema of feet or ankles, "indigestion" and fatigue
The patient is to become introspective to th being
on the alert for symptoms How much work o per
mit cannot be decided by mathematical formula he can
walk a half mile without symptoms during the walk sub
sequently, then he may do this but if a walk of a few yards
produces the symptoms then this little walk is too much for
him He must avoid activities which have repeatedly pro-
duced angina

Patients are often too embarrassed about revealing their
infirmities One can climb subway stairs slowly and appear
to be reading a newspaper as he does this, or if he be walking
along the avenue he may look in every shop window These
are illustrations of how one may favor his weakness without
making it apparent to others The patient is not to push
open sticking windows, nor is he to carry heavy baggage, nor
hurry to a train In fact, if packing his clothes for a trip is a
strain he must not do that Travel be it a long trip in an
automobile or a long trip on the train is enervating to many a
patient The individual should, in fact, avoid any strain
Standing still is an example The patient, particularly if
elderly, should permit others to help him on with his overcoat,
but what is even more important is that he should not wear a

the coarse vegetables, but I have found that if they chew these foods well they do not have distention   If they cannot chew these foods well, they must take strained or puréed vegetables Occasionally, a soda bicarbonate or bismuth preparation or some carminative, such as spirits of ether or of ammonia, gives help for the distention or belching   I usually advise the patient to have his dinner no later than 6 or 6 30 P M   Similarly, it is preferable for this routine to be observed in regard to fluids, particularly for patients who have attacks of nocturnal pain or dyspnea

The patient should be thin   Overweight[14] is an extra load on the heart, elevates the diaphragm and interferes with the heart, both mechanically and reflexly   There is the burden of fat which is not only of no benefit to the patient but which must be nourished by the blood vessels   There may be fat around the heart and fat may infiltrate the heart muscle   The vital capacity is diminished, the exercise tolerance is reduced The patient is advised to weigh himself daily as this makes him watch his diet   It is an extremely difficult thing for many patients to lose weight but it is an object well worth striving for Paradoxical as it may appear, I am always pleased to have to treat a fat patient for no matter how ill the patient is, or how far advanced his condition, reduction of weight will bring about improvement and even cure   In this connection, a word of warning must be spoken against the use of thyroid extract It would appear that this drug would be useful for two particular reasons   First, because as has just been said, reduction of weight is one of the most difficult therapeutic problems and requires assiduous attention to detail on the part of the physician   Second, because patients with coronary thrombosis are apt to have lowered basal metabolic rates, as has been pointed out by Libman[15] and repeatedly corroborated by us   Nevertheless, even small doses of thyroid extract such as ⅛ or ¼ grain three times a day may aggravate the anginal syndrome and larger doses are actually to be feared

Nitroglycerin, which is dangerous during an attack of coronary occlusion, is very essential for the continuous treat-

ment of a patient with angina pectoris Nitroglycerin, $\frac{1}{100}$ grain or less is prescribed, never $\frac{1}{100}$ grain because patients have occasionally gone into collapse on nitroglycerin A precipitate drop in blood pressure, severe headache and marked palpitation of the heart may result and a patient may be made uncomfortable for forty-eight hours following a single dose If the precaution is taken of giving these undesirable results will not occur Moreover the writer believes that $\frac{1}{200}$ or $\frac{1}{400}$ grain will cause relief of symptoms every time that $\frac{1}{100}$ would The patient is advised to have the tablets on hand at all times and to keep them where they are immediately and readily available

Nitroglycerin should be used as a preventive measure too If a patient knows that climbing stairs or eating a meal will give him pain or pressure, he should prevent the symptoms by taking a nitroglycerin tablet before doing these things

The use of tobacco is discouraged A severely ill patient is advised to cut out smoking entirely for at least three months Clinically, there is no doubt that tobacco is a poison to the patient with angina pectoris Again and again, I have made no change in the patient's routine of work, rest, or sleep except to cut out his tobacco Under this régime he has improved but on return to the use of tobacco has had recurrence of pain or other symptoms We are finding similar results at the Mount Sinai Hospital clinic The writer feels that statistical studies of coronary thrombosis or anginal syndrome with reference to how many sufferers are smokers or nonsmokers will be of no help and that more harm than good has been done by such data White and Sharber[16] have influenced many physicians as well as patients to persist in smoking arguing that it is the individual case that must be considered Whether it is a matter of allergy[17] or a matter of toxicity there is no doubt that tobacco in large amounts is dangerous to certain patients Even two to five cigarettes a day are harmful to a patient who has an idiosyncrasy to the weed Incidentally, it appears to make no difference whether the patient inhale or not If a patient is keen on smoking, the proposal is made to him that

he abstain from it for three months and if no relief from his complaint occurs during that interval then he will have proved that tobacco is not injurious to him   The writer,[8] by using quantitative measurements, has found that smoking diminishes exercise tolerance and also diminishes the vital capacity of the lungs   Incidentally, merely his presence in a room filled with tobacco smoke is usually as bad for the patient as smoking itself

Beer and wine, usually, should be avoided—beer particularly, as it is indigestible and causes distention of the stomach Wine may not have the same' effect on certain individuals On the other hand, hard liquor, such as Scotch, whisky, cognac, or brandy, has been beneficial to many a patient suffering from an anginal syndrome   In the group where marked arteriosclerosis is present these alcoholic beverages have been especially valuable   The patient must be warned, however, that if he partakes of liquor he may gain weight and so be forced to curtail, further, his food intake

The patient is advised to lead a philosophical and tranquil existence   This often appears to him to be an impossibility but on mature consideration he usually finds means of shaping his life so that he does a minimum of work and experiences the least amount of annoyance   Occasionally, a patient states that he must supervise his business, that his is a one-man job and that no one else can perform his duties, but, here again, by considering ways and means, he will find methods of lightening his burden   If his job calls for hard labor he must give it up If he is a teacher and holds both day and evening jobs he must give one up   He must learn to talk less because talking often causes fatigue and in a state of fatigue attacks are apt to be more frequent

It has been found that patients with hypertension,[2] unless this disorder disappears completely in their first attack of coronary thrombosis, have a stronger tendency to recurrent attacks than other persons   Hence, it is advisable to keep the blood pressure as near normal as possible   If the patient is obese, loss of weight[14] will do this   Plenty of sleep and rest

will be of tremendous help but hypertension is one condition in which the writer believes that a drug may be extremely useful. He has tried out many drugs for the cure of hypertension and is of the opinion that none is as efficient as chloral hydrate alone, or in combination with the bromides to keep the blood pressure down or to prevent sleeplessness and headaches in hypertensive individuals. It is realized that hypertension like the anginal syndrome, is subject to many remissions and hence it is hazardous to ascribe credit to a specific drug. After years of experience, however, chloral hydrate is considered to be extremely useful.

Patients with an anginal syndrome do better in a warm climate and mine are advised to spend their winter in Florida or in some other warm place, if they can possibly afford it. Extremely hot weather is to be avoided.

Although one may continue to describe in detail what is advisable for a patient and what is not the individual can easily learn this for himself. For example, a severely ill patient, particularly if he is overweight, will become exhausted and perhaps develop pain by bending over to tie his shoelaces. Similarly, he will learn that getting up from a low soft comfortable chair is an exertion and that jumping up quickly, or moving in jerks may be harmful and hence these things must be avoided. The question of sexual intercourse is always brought up. Since the time of Mackenzie [1] the medical profession has felt that this is rather beneficial than otherwise and the writer always permits it unless symptoms arise during the act. Although accidents occasionally occur the writer feels that on the whole sexual intercourse, when it does not prove to be of too much exertion, has benefited the patient.

The patient often drives a car or desires to do so, and here again his condition or, more particularly, his individual reaction to driving is taken into consideration. Driving is indeed harmful to the patient to whom this is a nervous, hectic, irritable and unhappy business. He must not jack up his car to replace flats. On the other hand if the patient has a small car from which he derives pleasure and drives it slowly and care-

fully and always allows plenty of time to reach his destination, driving may be a diversion   In fact, anything that relaxes the patient or gives him pleasure should be encouraged whether it be the "movies" or the theatre   Strenuous activities, such as handball, tennis, fast swimming, 36 holes of golf, should never be permitted, no matter how enjoyable at the time.

If a patient is doing badly in respect to the frequency, duration and severity of attacks of pressure or pain, or if he is becoming more fatigued, he is put to bed for a "rest cure" This is as effective as it was when Weir Mitchell[10] advocated it   In addition to being put to bed for one, two, three or four weeks, the patient is often put on a régime of a 750 to 850 calorie diet

In a patient with a tendency to congestive failure, the acid-producing drugs, such as ammonium chloride and ammonium nitrite, are extremely valuable   About 90 grains a day, in frequent small doses, are dispensed   Drug firms now put them out in enteric coated capsules which cause a minimum amount of gastric distress   When signs of congestive failure are present, such as dyspnea, orthopnea, particularly nocturnal or transient attacks, these drugs are helpful in themselves but combined with the mercury diuretics, such as salyrgan (German), neptal (French), and mercupurin (American), the best results are obtained   Mercupurin is as efficient as any drug of its kind on the market, if not more so, and has the additional advantage of being less expensive than the others   The medication may be given once or twice a week, either intramuscularly or intravenously   To prevent necrosis of tissue, one must be sure he is injecting into a vein   If the mercury diuretic is given intramuscularly it should be given deeply and before the needle is withdrawn the barrel should be removed and 2 cc of air injected   This clears the needle out and prevents seepage into the tissues when it is withdrawn

Occasionally, a patient with angina pectoris has such severe pain that drastic measures for relief are required   This type of attack is rarely seen now, undoubtedly because the condition is recognized and treated in much earlier stages than formerly

owever, in intractable cases paravertebral block[20] has been
ound to produce good results Nevertheless I am convinced
at this method will never be a great success except in the
ands of a thoroughly experienced surgeon who actually
filtrate the posterior ganglions

The advisability of thyroidectomy, as advised by Blum
art, Levine, Berlin, and Cutler and Eppinger is still an
pen question but certainly in the hopeless type on
hom they perform this operation there is no risk
ere again, I think that if the previously mentioned measures
re followed we will see fewer and fewer patients in status
nginosus or in congestive failure It is also to be remembered
at on a low calorie diet patients may have their basal metab
ism lowered to — 20 to — 30 per cent and, hence it is pos
ble that a few months on this diet may obviate the necessity
r a total thyroidectomy

Discussion —The starvation and low calorie diet for cor
nary thrombosis has both clinical and scientific recommenda
ons Benedict, Lusk and DuBois[22] have shown that under
ese conditions pulse rates may be slowed to 30 beats per
inute, blood pressure lowered and cardiac output diminished
lthough the minimum demand is made in metabolic activity,
e efficiency of the heart is not diminished Furthermore,
ese authors concluded that low calorie diets were beneficial
the patient with heart disease After all, the milk diet of
Karell[1] is such a regime and this treatment has proved suc
ssful for years

That food brings on heart pain is well known Heber
den's[11] patient observed that exertion after a meal was par
cularly likely to bring on pain That an overloaded stomach
auses symptoms is a trite fact familiar to patient and clin
ian alike In 1912, Roemheld investigated the relationship
etween the gastro-intestinal tract and the heart and coined
e expression gastrocardiac syndrome' He believed that
ention of the stomach, elevation of the left leaf of the
aphragm and toxic products of digestion are productive of
cordial or sternal pain Much corroborative experimental

work[26] has been done in this field   Investigators have found
that mechanical or nerve stimulation of the abdominal viscera
causes changes in the rate of the heart and produces cardiac
irregularities such as extrasystoles, auricular flutter and auric-
ular fibrillation   Rosenkov[27] found that blood from a fasting
dog had no effect on the coronary arteries but blood from a dog
who had eaten a meal caused constriction of these arteries
Roemheld considered that distention of the stomach caused
anginal syndrome, extrasystoles, tachycardia, faintness, belch
ing, etc   Wayne and Graybiel[28] disagree with this view and
conclude that it is the increased work of the heart produced by
food that causes the anginal syndrome   The exercise tolerance
of a patient was found to be decreased by 25 per cent after a
heavy meal   I have also noted a decrease in tolerance follow
ing food [8] Grollman[29] has, indeed, shown that the work of the
heart is increased after a meal   As the close association be-
tween the heart and the gastro-intestinal tract have been estab-
lished, both by experience and by experiment, too much atten-
tion cannot be given to the care of the stomach and intestines

It has been shown by many writers[30] that previous starva
tion, or the ingestion of small meals, frequently taken, rather
than ordinary meals taken three times a day, diminishes the
specific dynamic action of foods   Thus, we have scientific
corroboration of the fact that patients feel better, have a
greater exercise tolerance and are much less apt to develop
an anginal syndrome after a small meal, even on exertion fol
lowing a small meal

Another reason for advocacy of the low calorie diet is the
fact that foods which are ordinarily indigestible are easily
assimilated when taken in a low calorie diet   For example,
orange juice or other fruit juices, raw milk, cream, cocktails
containing gin and fruit juices produce no symptoms in con-
nection with the low calorie régime, whereas they frequently
do so when taken with a full diet

Jaffe, Dack and the writer[22] have demonstrated that an
800 calorie diet lowers the basal metabolism to — 20 and — 30
per cent   This is desirable because, as has been shown by

Grollman[29] and Blumgart,[31] the velocity of the blood flow and
the work of the heart is diminished when the basal metabolic
rate is decreased   Incidentally, these are the desiderata of the
Boston group of workers[21] who advocate thyroidectomy
Their object is actually to keep the basal metabolic rate at
between — 20 and — 30 per cent, figures that are obtained by
use of the 800 calorie diet   Similarly, rest in bed lowers the
work of the heart. Therefore, the combination of rest in bed
and small intake of food spares the heart best

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THE MANAGEMENT OF HEART DISEASE IN PREGNANCY

IN the earlier treatises on midwifery many of the authors
write about "the dropsy" complicating pregnancy and one
finds them also referring to 'fatal syncope occurring in preg-
nancy after labor" which they were at a loss to explain   It
seems most probable that the underlying cause for a consider-
able number of these complications and fatal outcomes was
cardiac disease

Later when some recognition was given to the complica-
tion of heart disease in pregnancy and the subject began to
hold a place in the indices of textbooks, it was either dismissed
as a very serious incident by those who apprehended the heart
disease or no emphasis was put upon it by others, because
they thought that "the majority of women with valvular cardiac
disease passed through pregnancy without serious harm though
they usually suffer extreme discomfort."

After 1825 the physiology and the pathology of the heart
during pregnancy began to receive attention and its importance
was soon becoming realized as noteworthy contributions on
the subject appeared   Soon afterward it gained serious con-
sideration and became duly appreciated as one may conclude
from the following comment   That although the large major-
ity of cases may go on to a favorable termination, yet there
are some which are attended with great danger   and which
can be carried through safely only by the greatest skill and
diligent watchfulness

As the treatment and management of cardiac disease in pregnancy were becoming better understood and organized, we find that emphasis on adequate rest, the free use of digitalis, ether anesthesia and the shortening of the second stage of labor by the timely use of forceps when applicable, were universally adopted and recommended measures　Today these are still fundamental in the care of pregnant and parturient women suffering from cardiac diseases　The gravity of the disease associated with pregnancy was so decided by some that marriage was discouraged and advised against in many instances where a young woman affected with cardiac disease and contemplating marriage sought the advice of her physician

When further investigations and statistical studies were carried out and the gravity of the disease graded according to the valvular lesion, especially in studies on rheumatic heart disease, mitral stenosis was the one which seemed to have the worst prognosis　Indeed, some considered this complication so serious that they advocated immediate interruption of the pregnancy as soon as the diagnosis of mitral stenosis was made We know now that such a viewpoint is extreme, even though it is still generally held that mitral stenosis is the most serious of the anatomical lesions

Whether the gravity of heart disease complicating pregnancy has been exaggerated by some or underestimated by others, it is unquestionably to be considered dangerous　The maternal mortality is reported to be in general between 5 and 8 per cent　This means that of approximately 18,000 women dying yearly in the United States from complications arising in 'the puerperal state, about 1000 succumb from cardiac disease　The incidence of the disease in pregnancy varies in different localities and clinics, and ranges from 0 15 to 4 15 per cent　Such a variation may be based on the fact that 85 to 90 per cent of all cardiac lesions are caused by rheumatic fever and that the incidence of rheumatic fever changes considerably in its geographical distribution

In the management of heart disease in pregnancy today, there are several important contributions which have given us

invaluable aid and have enabled us to offer the patient better care, treatment and, thereby, a much more favorable prognosis Among these may be considered the comparatively recent advances made in our general knowledge of the physiology of the heart in pregnancy It has been shown that the heart definitely undergoes vital physiological change during pregnancy, and that more stress is put upon its reserve especially during the latter half of the antepartum period and at the time of parturition Another considerable contribution has been the grouping of patients suffering from cardiac disease according to a classification based upon the functional capacity of the heart rather than the valvular lesion or condition affecting it This classification was worked out by the Criteria Committee of the Heart Committee of the New York Tuberculosis and Health Association and has been approved by the American Heart Association Because it is desired to refer to it later, the classification is copied and is as follows

Class 1 Patients with organic heart disease able to carry on physical activity without discomfort Ordinary physical activity does not cause undue fatigue palpitation dyspnea or chest pain Patients in this class do not show physical signs of cardiac insufficiency and rarely signs of active heart infection

Class Patients with organic heart disease unable to carry on ordinary physical activity without discomfort

(*a*) Activity slightly limited Ordinary physical activity causes undue fatigue palpitation dyspnea or chest pain Patients in this class rarely show physical signs of cardiac insufficiency or signs of active heart infection

(*b*) Activity greatly limited Less than ordinary physical activity causes fatigue palpitation, dyspnea or chest pain Patients in this class usually show one or more physical signs of cardiac insufficiency or the anginal syndrome or signs of active heart infection

Class 3 Patients with organic heart disease and with symptoms or signs of cardiac insufficiency at rest unable to carry on any physical activity with out discomfort There is fatigue palpitation dyspnea or chest pain at rest Patients in this class show marked physical signs of cardiac insufficiency or the anginal syndrome or signs of active heart infection

We have found the above classification of value and have adopted it accordingly in our clinic It does not mean however that every patient that is admitted to the antenatal clinic suffering with cardiac disease can be grouped and then treated categorically On the contrary, even though

this classification helps us to approach the treatment of such a patient more rationally, we are aware that at times the groups may overlap together with other factors and that each patient, as in all other instances, should be treated individually Perhaps one of the most important contributions that has favored the type of patient that is being discussed has been the development of prenatal care   Among women suffering from complications in pregnancy, those affected with the toxemias and cardiac disease are among those who have derived the greatest benefits from prenatal care   Lamb recently reports in a study of heart disease in pregnancy carried out in the cardiac clinic of the Brooklyn Hospital that the maternal mortality in patients who had prenatal care was 2 2 per cent, whereas in those who had no care it was 20 per cent, approximately ten times as great   This is a striking example to those who feel that too much emphasis is being placed on prenatal care

At this point it is desired to outline briefly the practice that is followed in this clinic in the treatment and management of cardiac patients who are pregnant   Early registration of all patients is emphasized and encouraged   Any patient giving a past history of rheumatic heart disease or of any cardiac disease or is found to have some current signs or symptoms of heart disease on the initial examination is referred to the cardiac clinic   A cardiac clinic should be included in the organization of every maternity hospital   The organization of our own cardiac clinic is made possible by the close cooperation with the medical department   The resident physician and obstetrician see these patients regularly and at frequent intervals   As soon as the patient has been seen in the cardiac clinic, an attempt is made to group her in one of the classes mentioned above and then treat her accordingly   If the condition warrants it, she is admitted at once to the hospital for more thorough study and observation   While she is hospitalized, the consulting cardiologist is called in to see the patient and her status is thereby better evaluated

Fortunately, as it has been shown from the figures and analyses obtained in this clinic, most of these patients are in-

cluded in Class 1 (about 70 per cent) About 15 per cent fall
into Class 2 (a), 9 per cent into Class 2 and 6 per cent in
Class 3

The patients in Class 1 and Class 2 (a) are considered the
mild cases and for the most part do well through pregnancy
and parturition They require careful antenatal observation
and follow up They are usually admitted to the hospital two
or more weeks before term This enables them to get more
rest and puts them in better condition for delivery They
are allowed to go into labor and their labor usually terminates
spontaneously or is shortened during the second stage by the
application of forceps Unless the patient shows comparatively
rapid and easy progress during the second stage, no time is lost
in terminating the delivery by the timely use of forceps It
is our practice to chart the pulse and respirations every ten
minutes of all cardiac patients in labor These two factors are
certainly among the most useful indicators of the patient's
condition and the heart's behavior Ether analgesia and anes-
thesia are always employed for the delivery of these patients
Should the pulse rate show any acceleration during labor and
especially during delivery, and oftentimes it does to some lesser
or greater extent, it is found to drop to within normal limits
early in the puerperium As a rule, the puerperium is un
eventful They are kept in the hospital a little longer than the
average patient during their convalescence and when they are
discharged, these patients are always referred back to the
cardiac clinic for careful follow up

The patients in Class 2 (b) and Class 3 form the group
that is more serious These patients are admitted two or more
months before term During this time digitalis therapy is
carried out and all attempts are made to get the patient in the
optimum condition In some the response to treatment is
most favorable Marked improvement is noted in cardiac func
tion and reserve If it is reasonably certain that the improve-
ment is such that the heart will be able to stand the added
strain of the last months and last weeks of pregnancy and
parturition then she is allowed to go into labor and as soon as

she reaches the second stage, delivery is effected by the application of forceps There is a good percentage of patients in this group that are carried to such a happy termination In those cases where very little or no improvement is observed in the cardiac reserve or where the history of decompensation is considered more serious, the pregnancy is terminated by cesarean section Here again it is obvious that every patient should be considered individually A number of these patients are carried practically to term before the operation is performed In others, in order to avoid the added stress and strain of the last few months of pregnancy, it is advisable to wait only until the fetus has reached the period of viability If it is felt that the patient cannot be carried any further without running the risk of a total break in compensation or of another break, if she has a history of a previous one, or was admitted seriously decompensated, then a cesarean section is performed as soon as it is thought that her condition will withstand the operation Tubal sterilization is effected when it is believed that a future pregnancy will endanger the patient's life by the further damaging of the already serious cardiac condition or by making her more susceptible to further breaks in compensation The operation is always performed under open drop ether anesthesia or in some few instances under local anesthesia It is advisable, whenever possible, to have the resident physician or an internist present during the operation These patients receive special care and observation during the puerperium They are kept in bed much longer and their stay in the hospital is protracted so that they may be discharged in as satisfactory a condition as possible They are also referred to the cardiac clinic for their postpartum follow-up

Summary —Heart disease in pregnancy should always be considered a dangerous complication In order to effect the optimum treatment and management, prenatal care is most essential Every maternity hospital should have a cardiac clinic where the internist and the obstetrician have an opportunity to work in the closest cooperation, and where

the examination and observation of the patient is better accomplished Grouping patients according to the classification based upon the functional capacity of heart is a valuable aid with which to approach the treatment of the patient The greater percentage of pregnant women suffering with heart disease are included into Class 1 and Class 2 (a) These are considered the mild cases and do very well throughout pregnancy and parturition The patients in Class 2 (b) and Class 3 are the more serious group and although a good number of them are carried to term satisfactorily with ut any major operative interference, a certain percentage of them justify termination by cesarean section Tubal sterilization is advisable when it is believed that the mother s life will be seriously endangered by a future pregnancy

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THE MANAGEMENT OF CRISES IN PULMONARY TUBERCULOSIS

THERE are few so-called "crises" or acute upsets in pulmonary tuberculosis The common ones are hemoptysis, spontaneous pneumothorax, and the rapid development of pleural effusion Considerably less common are air embolism during the administration of artificial pneumothorax perforation of a lung following pneumolysis or initial administration of pneumothorax and acute massive atelectasis

Hemoptysis —Let us first consider the patient who presents himself to you during a moderately copious hemoptysis A twenty four year-old male with a previous history of cough and expectoration, in whom the pulmonary roentgenogram revealed unilateral, moderately advanced disease with cavity formation, disclosed on physical examination numerous rales over the upper third of the chest, comparable to the extent of the disease as indicated by x ray examination The sputum contained tubercle bacilli, Gaffky IV While on bed rest during the first two weeks following the diagnosis the patient suddenly began to expectorate moderate quantities of bright red blood With the coughing and raising of the blood, he became nauseated and vomited small quantities of fluid with each coughing spell

The patient was first seen one-half hour after the onset of the hemoptysis The recent knowledge that he had tuberculosis combined with the terrifying experience of bleeding from the lung produced extreme apprehension It the

phase of hemoptysis, that is, the individual reaction to its oc currence, which is probably the most important to treat

At this point Osler's suggestion in "Aequanimitas" cannot be too closely followed A spirit of calm and assurance forcing the implication that you are not alarmed over the patient's condition and that the hemorrhage is not as serious as it may appear, is important for both patient and family Sitting on the edge of the bed, holding the patient's hand and suggesting that if he feels the irritation of the blood in his trachea not to cough violently but to "take it easy," and gradually expectorate the material, is the first measure Above all else, do not make a short and abrupt visit, quickly pre scribing medication and then leaving both the patient and family greatly upset Quietly explain to the patient that one rarely loses large enough quantities of blood to become exsanguinated The patient's fear that the bleeding will not stop must be allayed Explanation that the bleeding prob ably comes from a small vein and will gradually diminish in quantity and stop at the most after a few days is very helpful

Hemoptysis, even copious, is not by itself a necessarily serious event Let both the patient and family know that most hemoptyses are uncomplicated by extension of the disease This is a particularly important point to tell those patients who have had tuberculosis for some time and who fear that the hemoptysis means that the disease is spreading

It has been practically a uniform procedure to advise strict bed rest By "strict" I mean not allowing the patient to turn from side to side or to sit up or to leave his things on the bedside table On the one hand, saying that the hemoptysis is not serious and on the other advising stern precautions usually strikes the patient as contradictory Therefore he disbelieves your first statement The patient's fear is usually best allayed by allowing him to move in bed and to reach for things moderately if he desires This should be done not only to allay fear but for another important reason The major significance of hemoptysis is that in the presence

of a positive sputum, the blood will carry tubercle bacilli to other portions of the lung, there producing new disease Therefore, measures which will markedly depress the cough reflex should not be employed, having him lie quietly so that his breathing is suppressed or applied measures as lead shot bags tend to diminish the probably prevent expectoration of blood, which is better emptied from the lungs than retained

The application of an ice bag to the chest well advised procedure It probably does not affect the course of the hemoptysis, but it does give the patient a sense of security he feels definitely that it helps him

The use of morphine except in any but rare instance when the patient is extraordinarily excited and the hemoptysis is very copious is contraindicated, for morphine markedly suppresses the cough reflex and favors the retention of blood with tubercle bacilli and increases the chance of spread of the disease If the cough is frequent and severe, small doses of codeine (⅛ to ¼ grain every three or four hours) will suffice to diminish it   Just as with morphine, strong hypnotics should not be given, particularly at night, to insure sleep It is better that the patient have a somewhat restless night and expectorate blood than that he sleep and retain clots

As with hemorrhage in any other portion of the body, there is no specific treatment. Throughout many years practically all hemostatics have been tried, evidently with little success despite the enthusiastic claims of some Calcium in the form of lactate or gluconate apparently has little effect and is apparently given chiefly because of custom

The headache and nausea that not uncommonly complicate hemoptysis may be relieved by any of the simple drugs for this purpose

During the period of bleeding a soft diet should be used with limited fluid intake and only moderate amount of fruit juices No hot food should be allowed and the feedings should be in small amounts

Constipation for a day or two should cause no concern

unless there is distention and the patient becomes quite uncomfortable   In this event, mild laxatives or small enemas may be given   Diet and laxatives should be arranged to avoid either extreme constipation or marked diarrhea with their obvious discomforts

There is considerable controversy over the administration of artificial pneumothorax to control bleeding   The obvious contraindication is the presence of bilateral disease with the inability to determine from which side the bleeding comes As a rule, the patient can tell in which side the blood arises by a rattling of blood in the bronchi of the involved side Often this is verified by the stethoscope revealing bubbling râles and rhonchi over the area of the disease

However, we are often unable either by physical examination or by x-ray to determine at so early a stage whether the bleeding is from one side, or the other, it is hazardous to induce pneumothorax   Occasionally, in patients with unilateral cavity, when bleeding persists for some days without evidence of extension pneumothorax may be employed to stop it   If adhesions do not prevent, a satisfactory collapse cessation of the hemorrhage will probably result

Various other forms of treatment have been suggested for the bleeding aside from pneumothorax   Measures of rest such as phrenic nerve operations and lead-shot bags are occasionally resorted to   Drugs used include calcium intravenous injections (10 cc of 10 per cent solution of calcium gluconate), intravenous hypertonic saline solution (10 cc of 10 per cent saline solution), gelatin intramuscularly, large doses of camphorated oil (15 grains), inhalations of amyl nitrite pearls, adrenalin (0 5 cc $\frac{1}{100}$), emetics ($\frac{1}{2}$ grain every three hours short of the point of vomiting), coagulants such as thromboplastin, snake venom, blood serum, and even 250 cc blood transfusions   On occasion these drugs may be tried but a fatal hemoptysis is rare and it is probable that the cessation of bleeding often ascribed to the drug has been a spontaneous event

Spontaneous Pneumothorax —In pulmonary tubercu-

of a needle, pressures have become more positive while the patient remains in the same position, evidence exists that a fistula is present   Occasionally, air must be withdrawn at frequent intervals until symptoms do not recur   This, however, is unnecessary when there is no other evidence of pulmonary pathology than that of spontaneous pneumothorax

At times it may be necessary to leave a retention needle in the chest so that continuous evacuation of air takes place There is little danger of the occurrence of a chest wall sinus with this procedure when there is no evidence of pulmonary disease   Attached to the needle should be a pneumothorax machine on which readings may be taken at frequent intervals and one end of the tube should be placed beneath water to prevent suction of air into the chest through the needle

The acute pain usually quickly subsides   If it does not, it should be treated as one routinely treats pleuritic pain, namely, by the application of a tight bandage of adhesive tape, after having the patient flex his chest to the affected side and forcibly expire   If this does not suffice to relieve the pain, small doses of analgesics should be employed

A much more serious complication and one which may demand not only immediate attention but also prolonged treatment is the occurrence of spontaneous pneumothorax in a patient known to have a considerable amount of pulmonary tuberculosis   This is one of the gravest complications in pulmonary tuberculosis, for with rupture of the lung tubercle bacilli are usually distributed into the pleural cavity, to produce a purulent effusion   There is often also a permanent bronchopleural fistula and there is always the danger of chest wall abscess and sinus formation when performing thoracentesis in such a chest

These patients complain of sudden pain in the chest followed by dyspnea   They quickly become ill with fever probably due to the rapid onset of pleurisy   The immediate treatment is that outlined for idiopathic pneumothorax   The patient should be' placed on the affected side, air should be withdrawn in necessary quantities and pain should be relieved

as described above Many of these patient need more frequent withdrawals of air, as the pleura h tul is in a considerably diseased area of the lung which d not h t readily Usually, however, after three or four d close In such cases, it is important not to w w uch air and create considerable negative pressure t he t draw off only sufficient quantities to relieve t It is better to have atmospheric readings in ity and the lung fairly well collapsed to enh the fistula.

It is better to resort to frequent tapping of t f removal of air than to leave a needle in sit d drainage In some patients the dyspnea m t te rapid accumulation of a large effusion and in such instance fluid as well as air should be withdrawn The be t criteri n for the need of withdrawing fluid or air is the rate of re pira tion and pulse Although the mediastinum is found to be considerably displaced this by itself does not indicate need of thoracentesis, for the patient may be quite comfortable in the face of marked mediastinal dislocation In these patients it is important to suppress coughing which tends to maintain pleural fistula and also to increase the air in the pleural cavity If this is not accomplished by codeine, small doses of morphine should be employed ($\frac{1}{8}$ to $\frac{1}{6}$ grain) The subsequent han dling of these patients does not fall in the realm of this dis cussion.

In review, the cardinal features of treatment of spontane ous pneumothorax are Place the patient on the affected side use analgesic drugs and strapping to relieve pain and with draw air or fluid from chest in sufficient quantities to relieve dyspnea.

Rapid Development of Pleural Effusion —Pleural effu i n of tuberculous origin often occurs in patient with no pre ious evidence of pulmonary tuberculosis There are two ft rapid manifestations that may require immediate relief The more frequent symptom is severe respiratory pain which at times may be agonizing This pain which is due to the

tension of the inflamed parietal pleura which is stretched during respiration, can be remarkably relieved in simple fashion Any procedure which splints the affected side of the chest will relieve the pain It will be noted that patients lying on a soft bed generally lie on the unaffected side, whereas those on a firm mattress lie on the affected side since the firm bed restricts the costal excursion Having the patient lie with the affected side of the chest flexed over a moderately firm pillow will often strikingly relieve the pain This, however, may be an uncomfortable position to maintain and if the pain is quite severe and persistent the method of choice is the application of an adhesive tape bandage The patient should sit up, flex the affected side of the chest, and the chest be strapped as the patient holds his breath at the end of forced expiration Since the pain is also aggravated by cough and inasmuch as a severe unproductive cough is common with pleural effusion, codeine and also morphine should be used to suppress the cough

A less common symptom demanding treatment is dyspnea, which may occasionally be extreme when there is rapid accumulation of a large volume of fluid Here the treatment is exactly the same as for spontaneous pneumothorax, that is, the removal of sufficient quantities of fluid to relieve the dyspnea

One Word of Caution—Do not tap the chest more often than absolutely necessary In the presence of an inflammatory pleural exudate there is great chance of the fluid becoming purulent if tapped too often

Air Embolism During the Administration of Artificial Pneumothorax.—Considering the tremendous number of pneumothoraces given, air embolism is fortunately a rare complication It is well, first, to mention that although there is very little one can do for a patient with air embolism, there are nevertheless certain precautions which should always be observed to prevent its occurrence

1 During the administration of pneumothorax, there always should be maintained a closed system

2 Air should never be introduced through a needle in the chest, unless unmistakable manometric fluctuations are obtained indicating that the tip of the needle is in the pleural cavity

3 Following the obtaining of manometric readings and during the process of manipulation to allow air to flow into the chest, great care should be exercised that the position of the needle is not altered

Whenever air and sanguineous fluid are ⋯ the syringe, the needle point should be withdr ⋯ sible that the tearing of a small vessel in the ⋯ air within the lung to leak into this vessel

The great danger of air embolism is the lodg⋯ in the brain or sudden death from the entrance ⋯ ties of air into the pulmonary circuit.

There is little one can do for cases of large embolism ⋯ patient goes into almost instantaneous shock and ⋯ anything can be done   The usual measures for ⋯ treatment of shock may be employed   There is a difference of opinion as to whether the head should be elevated or dependent. However, the condition of the patient in these acute conditions is usually such that he cannot sit up   Cases in which transient localized phenomena supervene and which are probably due to small emboli are somewhat more common   There may be transient paralysis, pains or visual disturbances, or more often a dizzy, weak feeling with palpitation which accounts for the concept of pleural shock.   These patients are best treated conservatively with sedatives after they have been stimulated by aromatics   Otherwise, rest is the only treatment

Perforation of the Lung Following Pneumolysis — This is treated in the same fashion as when this perforation occurs spontaneously

CLINIC OF DR WINFIELD SCOTT   t H

GOUVENEUR HOSPITAL

GONORRHEA IN WOMEN   A CONSIDERATION OF ITS TREATMENT

In this day of scientific progress, many surprising fallacies still persist regarding gonorrhea in women   One of these is the oft repeated comment that once a woman in infected always infected   Another is the fixed idea, persistent over centuries, that every woman has a normal vaginal discharge   However, it is no more normal for a woman to have a vaginal discharge than it is for the male to exhibit a flow from his urethra

Many of our patients suffering from gonorrheal disease are seen only when the malady is far advanced and not infrequently women act as disseminators of the disease long before awakening to the fact that something is radically wrong   A typical example is Mrs B   Her husband, a merchant, returned home after a nine months' business trip in Europe   Shortly afterward he developed a mild gonorrhea   An examination of his wife revealed chronic gonococcal infection which she claimed—truly, I believe—must have been acquired some six months previously   "I thought it was part of my natural discharge," she explained, little realizing that there had been the addition of another intruder to bacterial hosts already present and strongly entrenched in her genitalia   This idea of a natural discharge' in women is a worthy companion of the "no worse than a bad cold" impression of gonorrhea in the male

and when medical teachers will discuss the disease under its
proper nomenclature, gonorrheal infection, and not merely as
endocervicitis

The erroneous concept that gonorrhea is only an endo-
cervicitis is widespread and has done much harm   A gonor-
rheal infection may involve all of the external genito-urinary
apparatus of the female, *i e*, the urethra, the genital canal,
its appendages, and the rectum   In acute gonorrhea of the
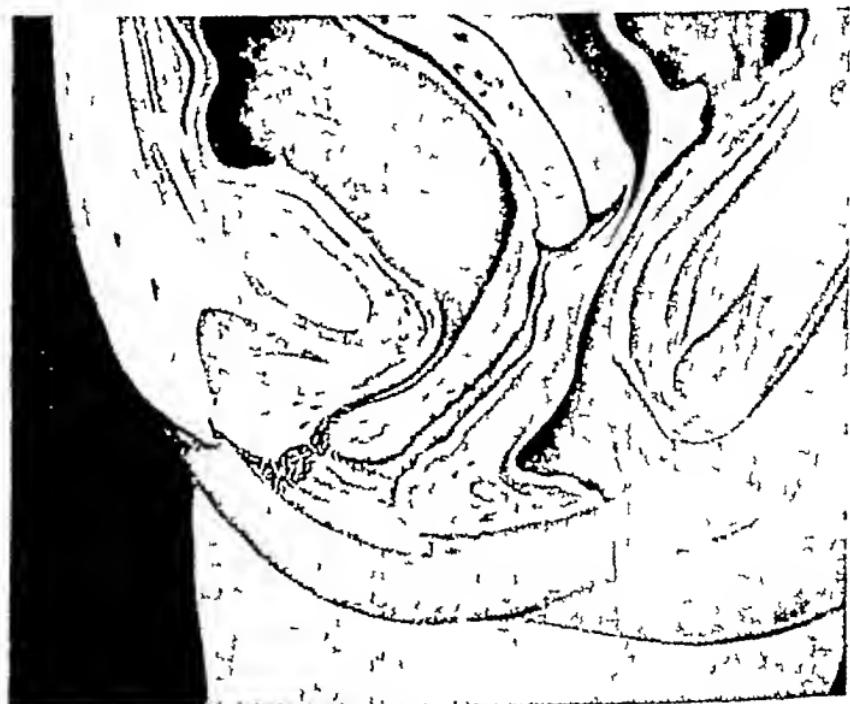
Fig   103 —Diagrammatic representation of a honeymoon gonorrhea   The
gonococci infect the urethra alone   Hymen was not ruptured

female, the urethra is involved in at least 85 per cent of cases
So convinced am I that the urethra is probably involved that
I always have it treated, even though it may give no definite
evidence of being diseased   Moreover, the urethra and its
glands are frequently the source of disease transmission after
all uterine involvement has apparently cleared up   Yet, in
90 per cent of cases seen by us secondarily, there is no history
of urethral examination, and this is true not only of patients
coming for treatment from junior assistants but from those of

far greater experience who, it ~   the female
urethra as no more than a canal t   n-trument
may be passed into the bladder   T   be exam
med most carefully in all cases   n being
paid to the glands of Skene the p   on the
floor, and to an important gland or   it the
meatus, or a very short distance in to   ough
little or no mention is made of thi.   oks,

Fig. 104—Diagrammatic representation of the march of gonorrhea in the female genito-urinary tract. Note bladder and urethra are turned and the gonococci up the urethra also up the from the cervix into and to the right tube

to a thumb when that part is reached   Support the hand by
pressing the finger that was used for stripping the upper
urethra against the back of the symphysis and advance the
thumb from this point downward until discharge is seen at
the meatus   At the same time, the forearm is supported by
resting the elbow upon one's knee or thigh   If the finger alone
is used, it will usually slip so that the findings, or their absence,
are deceptive

TREATMENT
THE PAROUS CERVIX

Gonorrhea of the cervix has gone through various forms
of therapy   Chemical, surgical, cautery, diathermy, and now,
once again, cautery

Chemical Treatment —Without doubt, chemical treat-
ment has cured many, but such drugs as mercurochrome,
gentian violet, and other sundry dyes have a pernicious habit
of advertising a woman's misfortune, against which every self-
respecting physician wishes to safeguard to the best of his
ability

Diathermy —In diathermy, we have a modality of great
value   By it, we may apply high heat of known degree which
will destroy the gonococcus in human tissues without injury
to the body structures   It is a bloodless procedure, produc-
tive of no shock   The adverse criticism which this modality
in gynecology has received recently has proved in nearly every
instance to have been aroused by the fact that equipment
utterly inadequate for the purpose was used   My own expe-
rience with diathermy in gonorrhea of women has been ex-
tensive and highly satisfactory, indeed   But it is of the utmost
importance that the diathermy operator have a heavy duty
instrument, not one of the many small machines with which
the market is glutted and which, no doubt, are valuable for
minor procedures but of little utility in gonococcal infections of
women   The apparatus to be used must have a voltage of not
less than 35,000, and a frequency of more than two millions a
second   Hence it represents expensive equipment for the
average physician, and in the clinic where a vast number of

patients must be treated as expeditiously as possible, diathermy is not practical in that it requires too much time

Conization — There are several other closely related systems of treatment addressed to the cervix in gonorrheal infection, such as the excellent technic of Mortimer Hyams,
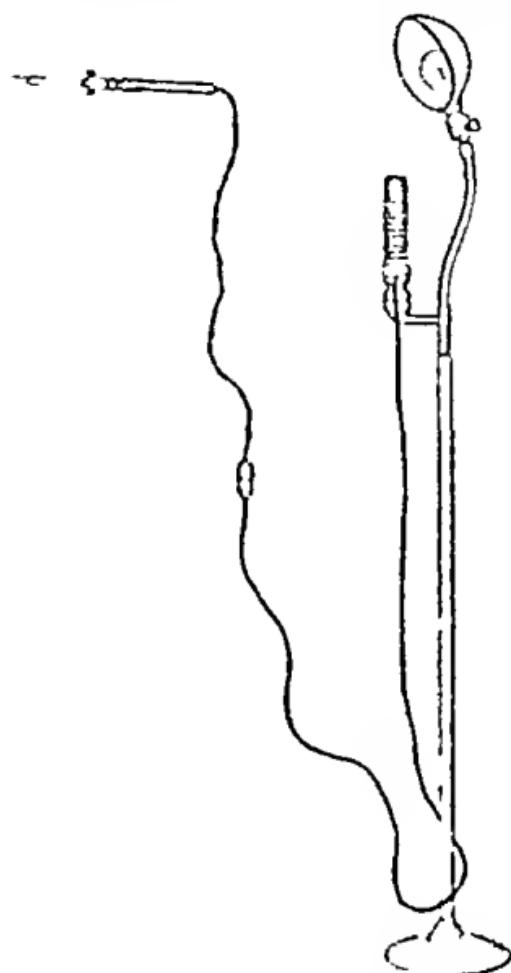
Fig. 105 —The cautery and handle connected to foot stand. The cord connects with a wall current socket

commonly known as conization, but this as well as many of the other forms of therapy of the female genitalia require the skill that is acquired only after long years of application. The form of treatment most accessible to the general practitioner is the actual cautery

Post Cautery —One needs the usual examining table

antiseptic trays and a pocket case In addition, there must be
a standard on which one may have a light for flooding the field,
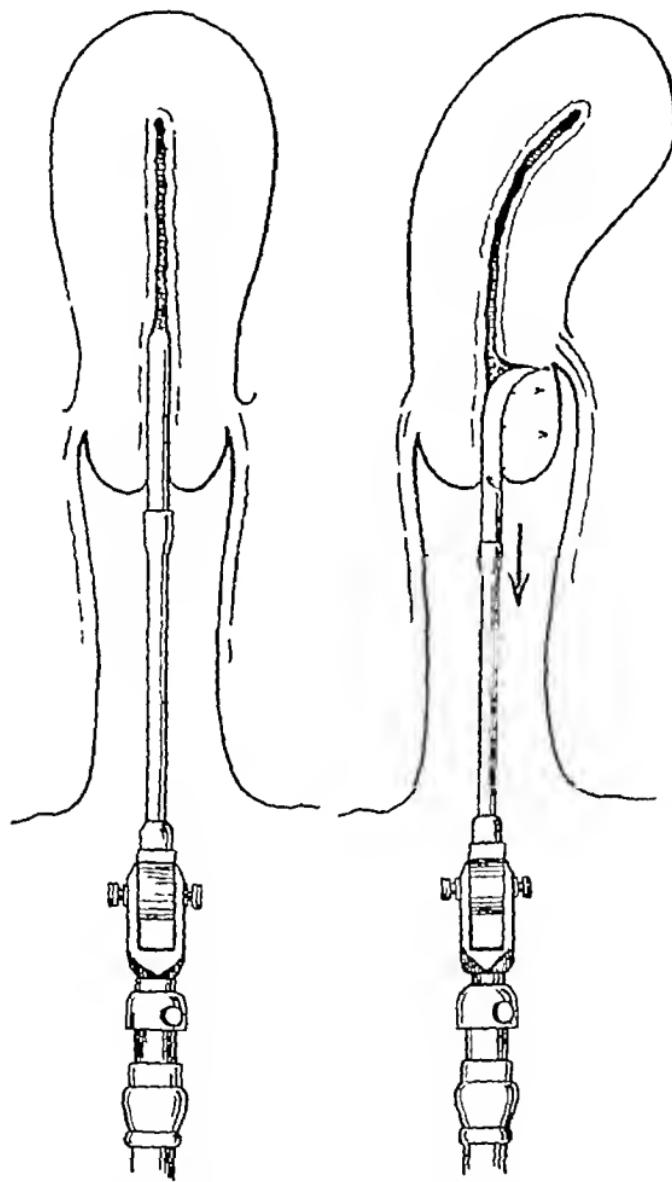
Fig 106   Fig 107

Fig 106 —The rod-shaped cautery tip inserted into cervix

Fig 107 —Cutting through cervix with a curved cautery knife to per-
sistent pockets

and a Post cautery, which is a simple, inexpensive appliance
(Fig 105) It receives its electric current from a wall plug,
either A C or D C

The patient is placed on the table in a lithotomy position, with the usual drapes. The legs must be well secured, should some form of anesthesia become advisable. For anesthesia, evipal is an intravenous anesthetic that acts quickly, safely and is useful for operations of brief duration. I use it often.

With this type of therapy, the specialist's routine of treating the urethra first is reversed. If one's experience has been limited, a tubular speculum of pyrex glass, of appropriate size, is introduced. Into the internal orifice of this instrument, which was originally known as the Ferguson tube, the cervix is brought. The glass very greatly reduces the patient's sensation of heat, by no means an unimportant feature. However, the ordinary Graves' speculum will suffice.

If the cervix is not badly lacerated or otherwise injured, select the rod type of cautery blade, connect it up, and insert it as far as possible into the external os and canal (Fig 106). With the blade in position, the current is turned on—yes, full force, the only way it can be used. In a few moments, the patient may complain of cramp or a sense of heat in the vagina, but the cautery tip is to be kept in place until a white, cooked appearance is markedly in evidence for quite a distance beyond the external os. If lacerations are present, they, too, must be thoroughly cooked. At times, a distinct ring appears about ¼ inch from the opening if not immediately, certainly within a few days.

If the treatments disturb the patient, a sedative such as sodium amytal may precede the therapy, or evipal may be administered intravenously as an anesthetic.

Amputation of the Cervix.—Amputation of the cervix with the knife has always impressed me as a rather drastic, often futile procedure, and an operation to be avoided wherever possible. However, I have been compelled to change my attitude somewhat with the introduction of the electric cautery. In certain cases of chronic cervical infection nothing less than complete ablation of the womb neck will suffice. However, it is strongly emphasized that this procedure is not recommended for those who see only an occasional case of gonorrhea, though

it must always be borne in mind as an ultimate possible necessity

THE NULLIPAROUS CERVIX

Thus far we have discussed the initial application of the modern cautery to the cervix that has exercised all of its physiological functions   Let us consider, now, the woman who has never had offspring, and in whom the canal is usually of less diameter   In her treatment, a small, flat blade is used, exactly as one would use the rod

If the cervical canal seems to be drawn to one side or is irregular (tortuous is a better word), one must exercise especial care   It is always possible that there has been a previous infection or that an abortion may have caused the formation of scar tissue which must be cut through to allow the free drainage that is as essential in this part of the body as in any other   Old fissures, too, must be cauterized

Cervical pockets, which are common, may cause one considerable worry   These persistent crypts usually lie just within the external os and I have often found it necessary to insert a sickle-shaped cautery tip into them (Fig 107), incising right through the entire depth of the cervix into the vagina so that drainage may be obtained   The incisions close quickly, as a rule

Number of Cautery Treatments Required—Reports to the effect that gonococci have cleared up in one sitting are not uncommon   But those who speak so optimistically reckon without the gonococcus   My custom is to repeat the treatment weekly and once during each week to see the patient in order to take a smear from the uterus, vagina, cervix, urethra, and rectum so that I may note what is going on   In a series of 1000 cases of cervical infection almost all required 6 to 8 treatments before the patient was free of the gonococcus   But do not overtreat the patient   Also, induce her to rest as much as possible

Such comments as "no gram-negative intracellular diplococci" do not appeal to me   Somehow, I am very suspicious of those extracellular diplococci, so-called

VAGINAL COMPLICATIONS

Abscess of the Vulvovaginal or Bartholin Gland —The most frequent complication in the lower genital tract is abscess of the vulvovaginal or Bartholin gland It may possibly be of nonvenereal origin, but one makes no mistake to hold the gonococcus as more than likely responsible Hot applica tions in the form of sitz baths are valuable in the treatment of any vulvovaginal condition aside from Bartholin gland infec tion When signs of suppuration appear, the abscess is slit from top to bottom and allowed to drain As a rule, this suffices, but it may become necessary to dissect out the gland or electrocoagulate it. However, this is distinctly a procedure for only one especially equipped to carry it out.

A little zinc oxide, ammoniated mercury, or some such simple application usually relieves local vulvovaginal irrita tions I have not found the injection of antiseptics such as mercurochrome into the gland ducts of much assistance.

OTHER GENITAL COMPLICATIONS

Acute Salpingitis —Undoubtedly, acute inflammation of one or both tubes is the most spectacular complication of feminine gonorrhea Conservative-minded surgeons say 50 to 70 per cent of salpingitis is of gonorrheal origin but this figure I consider very low Although a certain percentage of cases of salpingitis is incident to abortion, I still believe that 85 per cent are of gonococcal origin

Perhaps it is owing to the mellowing influence of years, but with regard to the treatment of the female organs I am becom ing more and more conservative In the presence of an acute salpingitis, there is no alternative to putting the patient to bed, and a hospital is the best place for her Ice caps are applied to the abdomen, then with the patient in Fowler's position copious hot vaginal irrigations are administered The irrigating fluid will not ascend into the uterus and increase the inflammation as suggested by some Diet is limited almost entirely to milk and soups and the intestinal canal is kept open Intestinal obstruction of course, may occur I re

tainly do not operate on acute tubes as the results of such radical procedure have been far from satisfactory, except in the event of the development of intestinal obstruction   Then there is no choice, it is operation or death   Another reason against operation is that conservation of tissue so highly essential in surgery involving the ovary, is very difficult in the presence of acute inflammation

Yes, I use fat-free milk protein and think it very useful, given into the gluteal muscles

Gonorrheal salpingitis is practically never fatal   Symptomatic recovery is the rule

Occasionally, appendicitis simulates salpingitis so closely as to make it impossible to distinguish between the two   An example of this kind is a young married woman who reported to me recently, two years after I had treated her for an acute gonorrhea, with an attack of pain in the lower right abdomen Although I could make out no distinct tubal mass, the whole pelvis was very sensitive   I called in consultation a gynecologist of extensive experience and in whom I have great confidence   His recommendation was   "Leave her alone!"   I did for a while but, as time advanced, she did not improve   At the end of twenty-four hours I felt it imperative to resort to surgery   Operation disclosed a gangrenous appendix which was followed by a fecal fistula, fortunately of short duration

CHRONIC PELVIC INFLAMMATION

Chronic Salpingitis, Hydrosalpinx and Cysts —When all symptoms of acute salpingitis have subsided, the residue must be treated   Chronic salpingitis, hydrosalpinx and cysts giving rise to symptoms call for surgical relief in the female who must earn her daily bread, though not always necessary in the instance of a woman of means with access to all the rest and nursing required in medical treatment

When surgery is necessary, it should be carried out with the utmost conservatism   Destroy the cervix, if you must, take out both infected tubes, but save at least a little ovarian tissue! I am one of the believers in the climacteric or menopause as an

entirely normal period in woman's life and that most difficulties
are due to false impressions erroneously implanted by others
But the premature menopause occurring in a very young
woman following bilateral removal of the ovaries is sad,
indeed I may at times risk too much in the other direction
but to date have had little cause to regret it

If the ovaries and tubes *must* be sacrificed, the question
arises whether it is good surgery to allow the uterus to remain
My own feeling is that its removal only too often constitutes
useless mutilation

Pelvic Abscess —Occasionally a pelvic abscess forms, fol
lowing an infection of the tubes Indeed, it is not unlikely to
succeed such ultraconservative procedures as suspension of
chronically diseased tubes and ovaries following gonorrhea
The best form of treatment is, if possible, to open the abscess
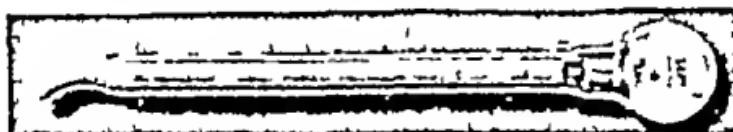
Fig 103

through the vagina and drain it through a very large tube,
preferably T shaped, inserted into the pelvis

Gonorrhea of the Rectum —Proctitis is by no means an
uncommon complication of gonorrhea since the anus frequently
soils from the vaginal discharge Jullien said, in 1856 that
gonorrheal proctitis although common in female infections was
seldom found because never looked for

When preparing for microscopic examination, rectal slides
must be included, especially because gonococci are sometimes
found in the rectum when discoverable nowhere else It is to
be kept in mind, also that this canal may be the source of
reinfection

These patients usually complain of itching of the rectum
or slight bleeding Many think they have hemorrhoids and
one case that I am now treating was diagnosed as pruritis ani

The therapy is simple Numerous hot sitz baths should be

accompanied by the twice daily instillation of silver salts such as protargol, 0 5 per cent, or argyrol, 10 per cent   By the Van Buren syringe I instill 1 ounce twice daily (Fig 108)

THE URETHRA AND ITS GLANDS

What of the urethra?   The problem that this short canal may present is seldom always fully realized before one has had occasion to observe many urethral infections   When there is acute inflammation I prefer to treat the condition with oleum santali four times daily, having found this very useful despite the fact that there are some who do not regard it so highly

One can also usually obtain great assistance from office instillations of 0 5 per cent protargol or 10 per cent argyrol, by means of a Van Buren syringe

After the subsidence of the acute stage, urethral dilatation is to be practiced exactly as it is in the male sex   Just as a competent urologist would not discharge a male without having first passed some sounds, he should not allow the female to escape without like procedure, for no form of urethral treatment is so valuable as dilatation

Inflammatory Areas in Skene's Glands—If such foci are present and not draining well so that there is a tendency to abscess formation, the suppurating areas must be opened under local anesthesia   If these areas of infection persist, electrocoagulation is the best treatment, though occasionally treatment with the fine cautery point will suffice

To expose these glands when the patient is in the office, I use a device recommended by Dr Howard Kelly   A bent hairpin is placed in a hemostat   The pin is then introduced into the urethra and slightly everted (Fig 109)

Other persistently infected glands in the urethra may and frequently do cause trouble, but often respond to the passage of large sounds   If dilatation does not suffice, they, too, must be subjected—not oftener than once a week—to electrocoagulation

Suburethral abscess may be a persistent focus of disease Gonococci are often harbored there after all other foci are

apparently clear. This condition seems to parallel periurethral abscess in the male. So long as the urethral orifice of the abscess remains open, all goes well. When it closes, a mass—at first the size of a pinhead but gradually becoming larger—appears in the vagina. If these pus foci are incised through the vagina, the result is apt to be a urethrovaginal fistula. The urethral end, with a little care, can generally be located and
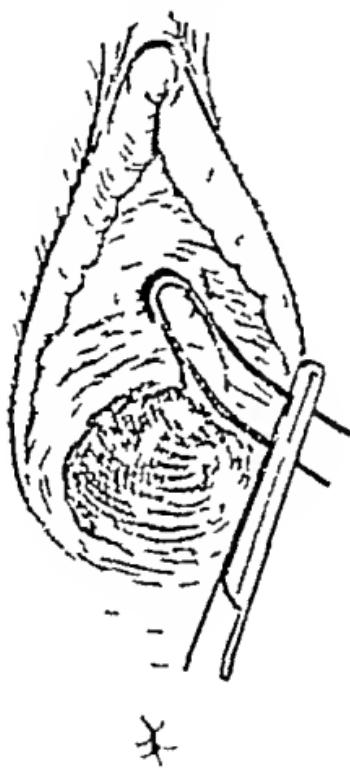
Fig. 109 - A single method of expressing duct of Skene gland. Method to be slightly everted by bent hairpin held in her hand.

drained. But do not too quickly report these women as negative for gonococci. I know of one woman who has sewn many seeds of gonorrhea after being passed by a number of skilled men as gonococcus free, until she reached me and a cheurethral abscess was fortunately discovered (Fig. 110).

Urethral Caruncle.—I have long believed that many of these annoying masses are of gonococcal origin and recently

this was confirmed by others These caruncles, which origin
ally accompany an infection of Skene's glands, should be
treated by electrocoagulation They should not be nipped off
with a pair of scissors or scalpel due to the danger of an
astonishingly severe hemorrhage On one of our services, a
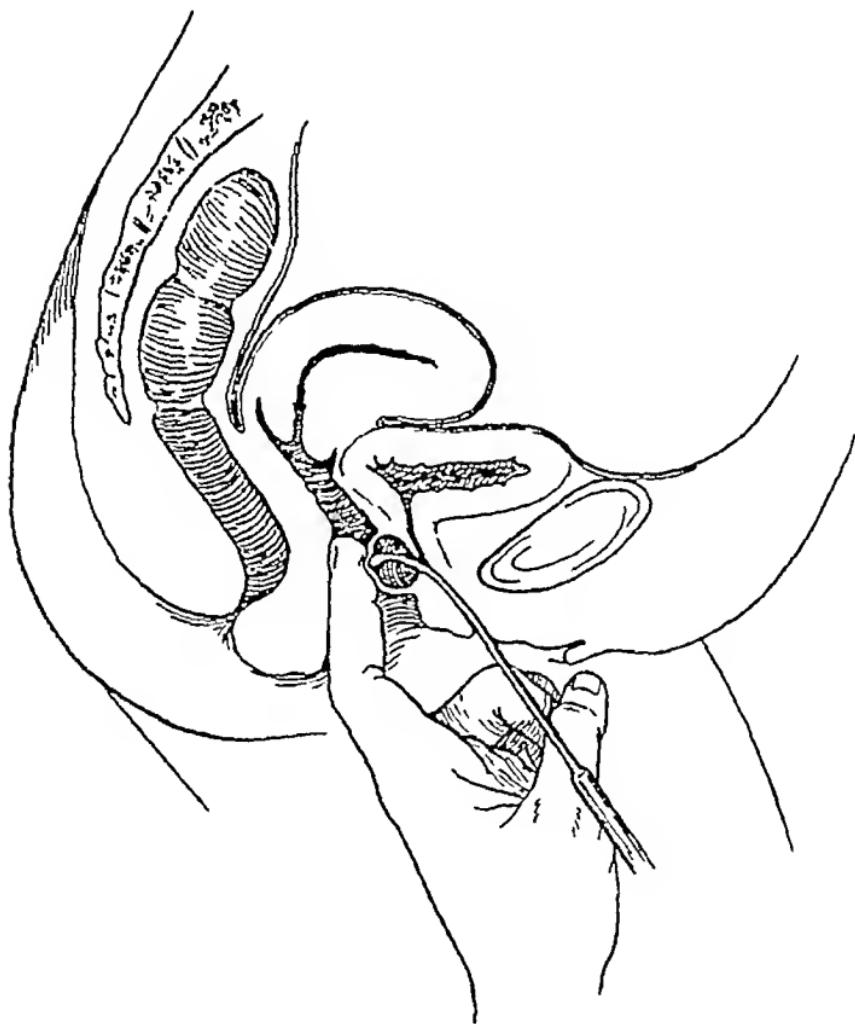
Fig 110 —Gonorrheal suburethral abscess, a persistent focus of infection
Probe enters opening of abscess in urethra

woman required blood transfusion following such a caruncle
removal

Vesical Neck Masses —At a time when the end of a gon-
orrheal infection has apparently been reached, the patient may
suddenly develop attacks of vesical tenesmus of varying sever-

ity The urine is usually clear, though it may be cloudy and contain a few organisms resembling gonococci Examination with the urethroscope usually reveals a semipolypoid condition around the bladder neck (that is, on the floor resembling a bladder neck bar), and in the adjoining urethra The finding is quite similar to the so-called "prostatic bar" in the male The lesion is best treated by some form of electrocoagulation, although I have also found the Young punch method of treatment quite satisfactory in certain cases

Stricture of the Urethra —Obstruction of the female urethra following gonorrhea is very common It is in itself a most important subject as I pointed out many years ago The reason for its frequency is realized when we consider how seldom the urethra is observed in gonococcal infections These obstructions explain a large proportion of urinary frequency cases in women and also account for the clearing up of such a condition after a single cysto-copy The treatment of the obstruction is simple A few cases, it is true, require surgery, most often a meatotomy But practically all strictures will yield to gentle dilatation Whenever a stricture of the ureter is suspected, the urethra should not be overlooked Many of these strictures are detected only by that wonderful little instrument, the bulbous bougie

CONCLUSION

I fully realize that in a brief space one is able to deal with only the essentials of therapy for such a vastly important subject as gonorrhea in women If I have stimulated you to further interest in this grave social menace, this clinic will not have been in vain

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Pugh, Winfield Scott   Stricture of the Urethra in Women, Jour Amer Med
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CLINIC OF DR BERNARD GLUECK

New York City

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THE PUERPERAL PSYCHOSES

PREGNANCY and childbirth, although natural events in the
life-destiny of women, have always been looked upon as expe
riences capable of causing a profound disorganization of the
personality releasing a mental disorder of greater or less
severity The simplest aspect of the problem relates to those
instances of mental disorder where a definite association be
tween it and clearly definable toxic-exhaustive factor can be
established One is here dealing with well known psychopatho
logical reactions of the organism to toxic exhaustive results,
the treatment of which follows a fairly well defined eliminative-
supportive regime and whose prophylaxis lies within the
domain of general medicine Nevertheless even in these
purely reactive manifestations to toxic-exhaustive experiences,
the element of personality make up cannot be neglected, since
prophylaxis as well as the ultimate outcome is conditioned to
a significant degree by this factor of personality make up and
type

Our main concern in this paper, however, will be with those
morbid mental manifestations which must be looked upon as
evidence of a woman s incapacity to measure up to the re
quirements for adjustment of the personality as a whole to
the events of pregnancy and motherhood one of the most im
portant tests of capacity for adult living The following case
histories are illustrative of the topic under consideration and
would serve as a helpful introduction to a theoretical discus
sion of it

anxiety and ambivalence as regards desire for a baby and considerable rumina
tion over changes in personal appearance in a woman who always prized very
highly her exceptional physical attractiveness

Delivery was normal and without any untoward physical after-effects
Several weeks later pronounced change of mood occurred She became elated,
ecstatic, overtalkative, overactive socially but incapable of focusing her
energies in the service of the needs of the child or husband   Constantly
wanted a crowd of people around her and entertained very extensively   This
state of hypomania lasted about two months and gradually subsided into a
state of moodiness and malaise, accompanied by a gradual loss of weight since
her confinement which had by this time reached a loss of 20 pounds

By the end of the summer, two months later, she returned to her occupa-
tion as part-time teacher of art and literature in a private school but soon
discovered that her concentration was difficult, that she was easily irritated,
that she was depressed and petulant and began to doubt her ability to meet
the requirements of daily living The depression of spirits and restless anxiety
gradually became more prominent, the job had to be abandoned, marked
feelings of inadequacy and tendency to self-deprecation developed and her
adjustment to her home more difficult   She became burdened with marked
feelings of guilt about her lack of affection for the baby and over fleeting
death-wishes with reference to it, also because of her indifference to an ador-
ing husband who was very much pained and worried over her condition
Facial expression was sad and anxious, she wept on the slightest provocation
She spoke of herself as being a total failure, useless, inferior to her husband,
and that she had made a mess of her life She called herself a bluff, no good,
never had any personality, etc

In February she went to Europe with her husband and another couple,
but the failure of the trip to bring about any improvement made matters still
worse   She felt keenly her feelings of inadequacy with reference to the baby's
needs Her admission to the sanatorium was precipitated by a suicidal attempt
by means of strangulation

Course in Hospital—She was quiet, neat and amiable on admission, ob
viously very much relieved at the idea of something radical being done about
the situation   This attitude, however, did not last   She refused to accept
the idea that her difficulties were due to a definite illness but insisted that it
was merely the natural outcome of a superficial and shallow life, full of bluff
and deception, and that there was no hope for it   She was stubborn and
obsessive in her argumentation   Described herself as being without any defi-
nite goal in life, never having learned to organize her work, never having
been able to fulfill obligations or meet responsibilities   Said she was the kind
that never learned to love anyone but only loved being loved and made a fuss
over, never even achieved the capacity to love her child   "Have no guts
ecessary to tackle this business of living " She was skeptical of physician's
iew of situation and lacked faith in any possibility of solution   Physical
xamination essentially negative   Four days after admission, while her nurse
7as out of the room for a few minutes, she cut her wrists with a nail file
7hich she had successfully concealed from the nurse   The act was discovered
few minutes later and no serious results followed but whereas she was vague

and uncertain about the genuineness of her previous suicidal attempt she
showed a genuine and persistent regret that the attempt had not been success-
ful She insisted that she wanted to die that there was no point in living the
life he had led that everybody would be better off with her out of the way etc.

The suicidal attempt seemed however to bring her to a more genuine
realization of the actuality and seriousness of her illness and constituted a
definite turning point for the better Improvement was uninterrupted from
this point on and by the end of May about three months after admission
she was able to leave the hospital live nearby with her family and continue
out patient treatment She was by then entirely free from the acute mani-
festations of her disorder depression feelings of inadequacy despair and hope-
lessness self-condemnation and guilt difficulty of concentration She was
very eager to undertake a detailed exploration of her background and per-
sonality as a prophylactic measure against recurrences of the difficulty in
connection with the next pregnancy upon which she was eager to launch It
might be stated in passing that she is at present less than a year after her
discharge from treatment the happy mother of a second baby about six weeks
old this second pregnancy and childbirth having been a very enjoyable and
constructive experience

and made normal progress in walking and talking On the other hand, she soon gained the reputation of being a sullen, headstrong individual, always insisting on having her own way and on being the center of the stage The arrival of a brother upset her very much, and as the little brother grew there was considerable rivalry between them, the patient having exceptional difficulty in tolerating the attention paid by parents and nurses to her little brother She loved to do the things boys did and was known as a tomboy type

She entered school at eight, learned very easily and progressed rapidly, entering college at eighteen In her early teens she formed a passionate attachment for a male Sunday School teacher, much her senior, a married man with several children She adored this man in silence and created for herself many opportunities for being in his presence and for soliciting his advice Her intense absorption in this attachment became noticeable to her parents and school associates and became the subject of some slight gossip and considerable anger and concern on the part of the father The mother was more compliant, ostensibly because of a greater understanding but in reality because of an identification with her daughter in this affair

Upon leaving this school for college, the patient evidently made a desperate effort to rid herself of this preoccupation through falling violently in love with a girl classmate with whom she had an intense homosexual affair lasting some three years She described this girl as beautiful, fair, blue-eyed and utterly dependent upon her She became very much interested in the subject of homosexuality and deeply distressed when observing advances made by older girls to young freshmen She came to look upon this as a form of corruption, and by the time she graduated from college had determined to do her best to rid herself of her homosexual tendencies She went to Paris to study painting and during this time had normal social relations with both sexes It should be mentioned also that during this year abroad, a maternal cousin whom she discovered to be a thoroughly sophisticated European, made quite a fuss over her On returning to America she again met her former Sunday School teacher and her old attachment for him flared up anew, with this difference in the situation that he acknowledged having similar sentiments with reference to her There followed a period of intense conflict between irresistible desire for this man, which was occasionally fulfilled under dangerous circumstances, and a terribly bad conscience over complicating the life of this highly honored married man and father of several children About this time her future husband came upon the scene He is a very conscientious, somewhat immature individual who fell madly in love with her and showered her with the most persistent attentions When she finally agreed to marry him, she did so as much to escape the complicated and painful situation with the teacher as for anything else Significant from the point of view of the light which her developmental background throws on the development of her psychosis is the fact that she was unsparingly frank with her future husband about her past history

When she was in the midst of her mental depression she characterized her life as a sham and a fraud, stating ' Each human being has a job to perform in the world, and I'm no exception Everything, however, has been made so simple for me all the obstacles smoothed out of my path by those who love

me that I've never developed the guts necessary to tackle this business of living I've gotten by with a minimum of pain I have talked in vague generalities glibly interpreting the statements of others never bringing my own mind to bear on any problems Worst, by far the worst of all is the delusion I seem to have built up in the minds of family and friends that I m not only a competent but an unusual person The faith that has been put in me the one challenge to me that has been made and I don't seem to be able to meet it on any score"

With this developmental background she entered upon her marriage largely in the hope of solving thereby a complicated subjective conflict No wonder that she found herself frigid, restless ly in search of some occupation and repeatedly reverting in her mind to her love affair with the teacher Motherhood was likewise entered upon in the hope of finding in it an escape and solution to her internal conflict Her husband was passionately desirous of a baby For a long time she could not conceive and was ostensibly very much distressed over this But when upon finally becoming pregnant, she was congratulated by an enthusiastic friend she expressed surprise at the fuss that was being made over the event.

We have already seen that when actually confronted with motherhood she found herself inadequate to the situation and developed a psychosis

Discussion—This seemingly lengthy case record is nevertheless only a relatively brief summary of the facts elicited during several months of partial psychoanalytic treatment after her recovery from her psychosis It is hoped, however, that it may serve to illustrate the biogenetic background found in a large number of women who break down mentally in connection with pregnancy and childbirth Without any attempt at minimizing the hereditary factor here, of a manic-depressive family strain, the women of this family, grandmother, mother and our patient have all exhibited difficulties in the natural assumption of their biologic destinies of womanhood In the case of our patient her intense mother fixation was not solved through the finding of a father substitute object relation in the impossible situation with the teacher The definite turning to homosexual interests was another, albeit unconsciously motivated attempt at solution This too failed and a solution was sought in a marriage that was devoid of enthusiasm or love Again failure came to light in her frigidity, restlessness, discontent and final mental breakdown in connection with childbirth

It would probably be very profitable to enter into greater

detail concerning the psychodynamics of this case, but that would entail a degree of theoretical consideration upon which we cannot enter here   But it must be clearly obvious that the idea of prophylaxis in the field of the so-called puerperal mental disorders, apart from the immediate medical and obstetrical considerations, reduces itself to an examination of the important question of psychobiological fitness for marriage   Similarly, therapy in this field cannot be considered adequate when its aim is limited to the cure of the existing disorder   It must include, in addition, an attempt at personality reintegration which would render the individual psychobiologically fit for dealing with the love-life on a mature level

Caso II —*The Psychosis*—A twenty-seven-year-old white primipara began to show signs of mental derangement about a month after a normal delivery She became excited, talked about the power of mind over matter, said child birth had opened a new vision of life to her and that this would revolutionize the entire field of medicine   She showed little interest in her baby, began to exhibit tendencies which the relatives felt were just the opposite to her usual self   Whereas she had always been considered a somewhat shy, retiring, modest type of individual, giving the impression of a repressed and rigidly controlled sort of person, she became boisterous, imperious, demanding and talkative She misidentified things and people in her environment, thought of herself as a moving picture actress, became suspicious of those about her, and childishly petulant and antagonistic toward nurses and doctors   Her condition necessitated commitment to a sanatorium but her lack of cooperation, resentment of and rebellion against the necessary restraint made the care of her very difficult, so that by the time she entered Stony Lodge in Ossining, New York, she had already been in three different institutions, residing in each about six weeks

Course in Hospital—From the very beginning she manifested an intense resentment to the indispensable routine requirements of living under a hospital régime   Her resentment manifested itself in a stubborn but unorganized rebellion against the nurses and physicians, scratching, kicking and fighting them on slight provocation, she broke windows and kicked in doors and would exhaust herself if permitted to carry out these conduct tendencies to her satisfaction   But this stormy outward petulance and rebellion never seemed to be accompanied by an adequate and appropriate emotional tone   A few minutes after a most violent and exhausing tantrum she would converse calmly about some unrelated subject, denying and negating completely the stormy episodes which she had just lived through   She was suspicious to a morbid degree, believed medicines and food were poisoned and had distinct delusions of reference   Not being able to see her child meant that the child was kidnapped, the father writing to her of a surgical operation which some relative

had to undergo meant that this relative was dead her father was dead etc.
Although she never admitted the presence of hallucinations her manner of
attentive listening at the windows and doors when no one was speaking was
very suggestive of the presence of hallucinations. At one time she did say
he had heard her husband s voice over the radio   She assumed grandiose
poses ordering the nurses about in an imperious fashion and speaking of
herself in terms of self aggrandizement   But in spite of the storminess and
noisiness of her outward behavior she never exhibited an adequate emotional
response   Even when speaking of her medicines being poisoned he did not
show any real concern   She was not always accurately oriented, and her judg
ment was defective   She remained in the hospital about two and one half
months requiring a great deal of sedation before the excitement subsided and
he could be given increasing liberties about the hospital grounds   But this
subsidence of the outward manifestations of her disorder was not accompanied
by any improvement in insight and judgment about the situation   Neither
did we ever succeed in achieving a genuine psychological rapport with her
She was evasive and suspicious to the very end although ostensibly free of her
former antagonism to the personnel of ·
the her mental content was shallow

father fixation   At any rate, the father's letters to her during her illness clearly indicate his own excessive attachment to his daughter   But as is true of the preceding case, the primary question is not so much one of nosological classification, but of fitness, apart from the psychosis, for marriage and parenthood   The psychosis is but a symptom of the failure to meet the requirements of marriage and parenthood

In a paper on the subject published in 1928, Zilboorg[1] notes some fifty odd references, extending almost to the middle of the eighteenth century   The clinical reports on the subject are very extensive, indeed, and there is no point in burdening the literature with more case reports   But it is highly significant that all this vast literature has been of very little help in elucidating the subject or in furnishing dependable guiding lines for prophylaxis or therapy until the advent of psychoanalytic psychology

In this connection, the series of papers on the subject by Zilboorg[2] deserve particular mention, because of the emphasis that is reflected in them on the dynamic aspects of the problem

Medicine has always recognized certain deviations of structure and physiological functioning as counterindications of pregnancy and childbirth   The psychiatric envisagement of the problem should serve to focus attention on certain features of the psychological, and particularly, the psychosexual development of the individual as danger signs which might be looked upon as counterindications of pregnancy and childbirth Indeed, these same features in the developmental history of an individual portend difficulties of adaptation to the tasks and obligations of parenthood, and are of equal significance in the male and female   The sources of marital maladjustment, an important aspect of which are difficulties of adaptation to the

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[1] Malignant Psychoses Related to Childbirth, Amer Jour Obst and Gyn, Vol XV, No 2, 1928

[2] Zilboorg, Gregory   Post-partum Schizophrenias, Jour Nerv and Ment Dis, Vol 68, No 4, October, 1928, The Dynamics of Schizophrenic Reactions Related to Pregnancy and Childbirth, Amer Jour Psychiat, Vol VIII No 4, 1929, Depressive Reactions Related to Parenthood, Amer Jour Psychiat, Vol X, No 6, 1931

rôle of parenthood, do not necessarily or even largely lie in those external events which are the publicly alleged sources of divorce or separation. Their roots are to be found in certain personality characteristics of the man or woman, which are frequently favored by certain hereditary constitutional predispositions. But this is not necessarily so. Unfitness for marriage and parenthood may be due entirely to certain developmental, pathogenic vicissitudes which some day, in a more enlightened social system, will be found to be responsive to correction, as indeed they are today in certain fortunate instances.

In view of the contributions from the fields of psychoanalytic psychology of the past quarter of a century and more, it should not be necessary to reiterate that psychosexual and social fitness for marriage and parenthood does not come to fruition suddenly, at a certain more or less fixed chronological age, as is the case with the physiological readiness for these functions. It is rather the culmination of an evolutionary process of adjustment and adaptation which has its beginning at birth and its most intensive differentiations before the child has reached the age of five or six. It is during this period that feelings, attitudes and capacities with reference to the biologic destiny of man or woman become established. It is during this period that the original and universal bisexual disposition is subjected to those modifying influences which determine how completely masculine or feminine a given individual will emerge as an adult. These early years likewise determine the degree of plasticity or fixity with which infantile forms of organic gratification and indulgence are managed. It is the lure and attractiveness of these early sources of organic satisfaction, oral, anal, masturbatory, which favor the regressive tendency in the fact of later difficulties of adaptation. Those difficulties of adult adjustment which are fostered by excessive tendencies to guilt and shame can likewise be understood best by references to influences exerted upon the child by parents, nursemaid, teachers, sibling, etc. during these early developmental years.

Thus a true conception of prophylaxis in the field of the puerperal psychoses is coextensive with prophylaxis in the general field of psychopathology, and it is subject to the same opportunities and limitations Careful scrutiny of the developing boy or girl with respect to early feeding and excretory adjustments, the observation of the types and intensities of reaction to the inescapable denials and privations that go with the process of progressive adjustment to the increasing complexities of the realities of life, the manner in which the growing child manages the necessity of striking a healthy and workable balance between egocentric and social interests, the use the boy or girl makes of the opportunities for friendship which come his or her way, all of these important evidences of what is going on in connection with the maturing and socializing process, offer important opportunities for prophylactic interference Fortunately these issues have been attracting to themselves an increasing amount of intelligent attention and scrutiny of late years with the advent of the child guidance movement It is not so much lack of knowledge as lack of opportunity which determines the neglect of obvious developmental anomalies with respect to the issues just discussed in most instances of childhood maladjustment Unfortunately, the same is not true of certain indications of personality difficulties in the adolescent A careful scrutiny of the clinical reports of failures at the psychological and social levels of adjustment to marriage and parenthood leaves no doubt that in many if not most instances these failures could have been predicted The shy, retiring, shut-in type of boy or girl who manifests difficulties in discovering and cultivating friendships with the opposite sex should make us suspicious of fitness for marriage Eccentric or extremist notions about sexual matters, whether these be in the direction of puritanism or its opposite, are similarly suspected Particularly noteworthy are such characteristics when accompanied by excessive tendencies to rumination, self-scrutiny and day-dreaming It does not, of course, signify that such boys and girls are necessarily permanently unfit for marriage and parenthood The period of adolescence itself

brings forth unusual and sometimes very distressing behavior reactions in the average boy and girl who later progress normally. But an extensive experience with the maladjustments and psychopathies of adults leaves no doubt that timely interference during the adolescent period would have shaped a different and more adaptive life in many instances.

The woman who exhibits unusual difficulties in the economics of her affections as between a parent and husband, who does not respond with the normal and expected degree of compliance and sharing in connection with the facts and realities of conjugal life, the woman who is, in other words, persistently frigid sexually, is the type of woman who is likely to break mentally under the additional stresses of pregnancy and childbirth. Similarly, the man whose sexual adaptation is burdened with the avoidances, compromises and inadequacies in the psychoneurotic or prepsychotic individual is not likely to turn out to be a successful husband or parent.

Apart from certain hereditary constitutional predispositions which are to all intents and purposes as obscure today as they ever were, the causes back of these psychosexual maladjustments and developmental anomalies are being increasingly illuminated and defined by the contributions from psychoanalytic psychology. Certainly enough evidence is at hand to put a stop forever to the mistaken and distinctly harmful view which sees in marriage or in otherwise prearranged opportunities for sexual outlet a cure for these difficulties. Many of the cases of puerperal mental disorder clearly demonstrate the fallacy of marriage as a therapeutic hope. A number of these women enter upon marriage in spite of a natural reluctance, inhibition or even positive fear of undertaking the step because of the urgency of a devoted parent and sometimes, regrettably enough, on the advice of the family physician.

Sexual frigidity in the female and impotence in the male, whatever else it might be due to, always deserves careful scrutiny as regards the question of sexual differentiation. I mean by this the degree of homosexual disposition which enters the situation. The original and universal bisexual disposition

of man and woman seems to be never completely and permanently eliminated   Evidence for this is to be found not only in the ease with which men and women regress to homosexual practices under certain conditions of prolonged deprivation of heterosexual outlet and in the homosexual trends exhibited in the dream, but also in the sum-total of characteristics of the average man or woman   It is remarkable to what extent the prevalent social attitudes and overt mores of a group or community determine the exhibition or restraint of homosexual tendencies   On the other hand serious difficulties of adjustment to marriage and parenthood may be conditioned primarily, if not entirely so, by unconscious homosexual tendencies of which the individual is only vaguely or not at all aware, or which express themselves in an indirect and symbolic manner

It would lead us considerably beyond the scope of this paper to enter into a detailed discussion of the psychodynamics of homosexual conditioning of a personality   The subject is fully discussed in the standard psychoanalytic literature and is quite helpfully illuminated by Zilboorg in the papers already referred to   No reference, however, to a prophylaxis of the puerperal psychoses can neglect a deep concern with this question

The prophylaxis of these disorders is of considerable individual and social significance   Their prevalence is probably greater than is commonly realized, and it is the opinion of a number of obstetricians that these disorders are on the increase   Zilboorg tabulates the reports of a number of observers, covering a total of ten thousand psychotic women, in which he shows that 8 7 per cent belonged to the puerperal group   The figures are lower for the state of New York, here puerperal psychoses present 3 to 4 per cent of the total of first admissions to state hospitals   The contrast between the two figures may be, according to this author, at least partly accounted for by the fact that the data of the New York State Hospital system cover only first admissions

As to treatment, all investigations of the subject have come to emphasize the point that these puerperal mental disorders

do not constitute a specific clinical entity. Symptomatically they are no different from the well known respective toxic-exhaustive, manic-depressive or schizophrenic pictures observed in nonparturient women. It should be added, however, that insofar as these psychoses do possess distinctive features, they relate to the specific content of delusional or hallucinatory manifestations or symbolic actions and behavior. This may be the case, also, in those instances where pregnancy and child birth seem to have served merely to release a manic-depressive or schizophrenic attack in a predisposed individual. But it is precisely this specificity of content which gives us important therapeutic clues. The management and therapy of the acute phase of these disorders differs in no way from what is called for in connection with similar disorders in the non parturient women and is subject more or less to a similar destiny as regards course and outcome.

The therapeutic problem in these cases assumes, however, a special significance and presents a special challenge because of the association of these mental failures with what might be looked upon as the most normal function of woman. What are the possibilities of modification of attitude and reintegration of personality so that a more normal acceptance of one's biologic destiny might be achieved? An answer to this question is burdened with the same difficulties which confront similar questions in the entire field of, at least the so-called "functional psycho es and psychoneuro es. It is a well known fact that mental patients have recovered their health in greater or less numbers before the advent of the difficult and complicated technic of the psychoanalysis. It is likewise true that there has been a gradual improvement in the recovery rate of mental patients even when psychoanalytic methods are not employed. But the contributions from this latter field force upon us the necessity of a distinction between a recovery in which the patient was merely freed from his symptoms and reacquired the status-quo ante and one in which in addition to the rid dance of the immediate manifestations of the disorder the pat nt has acquired a greater or less degree of freedom from

the need for symptom formation   Such an envisagement of
this therapeutic problem presupposes a point of view concern-
ing mental disorder generally which is radically at variance
with the traditional, prepsychoanalytic view of the matter   It
sees in those personality reactions which we designate as mental
disorder evidence of either an effort at the solution of a sub-
jective, instinctual, biological problem, or of signs of defeat
and frustration in connection with it   It presupposes a view of
mental disorder which places adequate emphasis upon internal,
subjective, that is, biogenetic etiology, and which in turn sub-
scribes to a specific view of human nature   This view is based
upon the findings of depth or psychoanalytic psychology, and
is briefly to the effect that adjustment to the requirements of
daily living in association with others has as a prerequisite, an
internal, subjective adjustment between the claims of instinct
and those of the acquired and introjected cultural dispositions
of civilized man   Modern biology corroborates the findings
of psychology in the matter of the so-called "original equip-
ment" of man, an equipment which contains instinctual dispo-
sitions of an egodystonic nature, that is, dispositions which
strive for realization in thought and action but which are in-
acceptable to the personality as a whole because they are
unadjusted to the requirements of civilized living   These ego-
dystonic dispositions and the drives and impulses associated
with them have to undergo a process of change and revaluation,
by way of modification, repression and sublimation if they are
not to interfere with the normal integration of the personality
At best, the successive integrations of the personality at the
various levels of functioning are unstable, and subject to dis-
equilibration in the face of certain stresses of life   Pregnancy
and childbirth, apart from the profound physiological changes
and stresses which accompany these events, constitute a signifi-
cant adaptive challenge in the psychosexual and social levels of
functioning   Unless an adequate degree of adjustment has
been achieved to the internal subjective play of forces to which
we have referred above, this adaptive challenge cannot be
adequately met and the mental disorder is the result   The

fact that many of these patients give evidence of psychopathic disposition does not alter the situation, since the psychopathic disposition itself can be most helpfully understood on the basis of a view of human nature such as we have briefly outlined above

The brief digression into the realm of theory was unavoidable for a consideration of the question of therapy in the disorders under discussion. Whenever the conditions for a thorough going psychoanalytic therapy are favorable, this procedure should certainly be accorded first consideration. Unfortunately, the demands as regards personal equipment, time and money outlay which a thorough going psychoanalysis imposes render this method available to a relatively few individuals of the many who might be benefited by it. It is a practical rather than a scientific problem and efforts are being exerted within the field of psychiatry as well as medicine as a whole at the mitigation, if not the actual solution of it. Notwithstanding the still existing popularity of an antagonistic attitude toward psychoanalysis, most psychiatrists and physicians are becoming increasingly aware of the significance of the contributions of psychoanalytic psychology for the understanding of normal and abnormal functioning. These findings are being applied to greater or less degree in the practice of medicine and psychiatry, if not as a formal therapeutic endeavor, certainly as a means for a better understanding of disease in relation to personality. The recovered puerperal psychotic has a much better chance of remaining well and of making a healthy adjustment to a subsequent pregnancy and childbirth if in the process of recovery a better insight has also been acquired into the psychodynamics of the disorder. She is likewise apt to be a better adjusted parent and thus contribute her share to the prophylaxis of mental disorder. Similarly, a greater diffusion of these points of view among obstetricians should lead to the early detection of dangerous signs of difficulty of adjustment to the events which we are discussing, and thus possibly prevent a mental disorder through timely and appropriate interference.

CLINIC OF DR. I. S. WECHSLER

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TREATMENT OF POLYNEURITIS

THE treatment of polyneuritis has undergone considerable
change in recent years. To this, advance in knowledge as to
causation and the role of general dietary, and more particularly
vitamin, deficiency has contributed in large measure. Hither
to attempt used to be made to discover the specific etiologic
factor in the form of some exogenous poison, and if possible
neutralize or remove it, and then to treat the patient sympto-
matically or palliatively by means of analgesics, baths, mas-
sage, electricity, and so on. To a large extent this still holds,
but with changing conceptions both as to etiology and pathol-
ogy, treatment too has changed. It is becoming questionable
whether in speaking of polyneuritis we have in mind one spe-
cific concept, whether the whole conception fits in with the
pathology of an inflammatory process which the very term
connotes and whether the etiologic factors generally regarded
as specific are in fact the ultimate or even the sole causes. It
is a question therefore, whether all forms of polyneuritis can
be treated more or less uniformly. And so, before entering
into a discussion both of general and special treatment it be
comes necessary to inquire once more into the general nature
of polyneuritis, even to the extent of challenging well estab
l hed concepts, to reexamine the question of etiology and to
dwell a little on classification and on some points in diagno is

Among the general causes of polyneuritis commonly men
tioned are chronic intoxication with alcohol, lead, arsenic and
other heavy metals phosphorus sulphur, carbon monoxide,
benzine carbon bisulphide. Infectious diseases, such a diph

theria, influenza, pneumonia, puerperal fever, mumps, typhoid, typhus, dysentery, tuberculosis, gonorrhea, syphilis, and meningitis, possibly also malaria, diabetes, rheumatism (periarteritis nodosa), gout, leukemia, pregnancy, beriberi, pellagra, cachectic states   Finally, there are cases in which no cause can be found despite all effort, and the easiest way out is to say "toxic" without being able to define exactly what is meant by the word   However, the conviction has gradually grown that, even aside from pellagra and beriberi, not all the factors just enumerated are in themselves always sufficient to cause polyneuritis and that in a great many of them the question of avitaminosis plays a considerable, if not the ultimate, rôle   This is based on the observation that of the untold numbers of persons who partake of alcohol to excess only very few develop polyneuritis, of the many patients who receive arsenic medication an infinitesimal number show inflammation of nerves, and of the thousands of diabetics, for instance, so few actually have polyneuritis   Parenthetically, it may be said that infectious polyneuritis, aside from being rare, presents an entirely different problem, and will be dealt with separately

Especially worthy of emphasis is the fact that a great many patients with polyneuritis, of whatever cause, give a history of antecedent anorexia and such gastro-intestinal disturbances as constipation, vomiting and diarrhea   Practically every case of pregnancy polyneuritis, whether or not there is an associated Korsakoff psychosis, is preceded by intractable or so-called pernicious vomiting   Not a few patients who suffer from debilitating gastro-intestinal diseases, or prolonged gallbladder infections with anorexia, vomiting and loss of weight, develop polyneuritis   The neuritis which occasionally occurs in the course of cancer of the stomach and other cachectic states may well be due to starvation and avitaminosis   The fact is occasionally established by the disappearance of the neuritis after removal of a gastric cancer   The chronic alcoholic who suffers from loss of appetite and retching and vomiting and constipation or diarrhea surely is deprived of food   Because of his gastritis and hepatic involvement he does not eat, and

if he eats he does not digest, and if he does digest his food
he does not metabolize or assimilate what he ingests   In
diabetes the patient is frequently deprived of foodstuffs which
are richest in vitamins   It may also be pointed out that lead
affects the gastro-intestinal tract with resultant loss of appe
tite, coated tongue, constipation and colic, that arsenic taken
by mouth may also affect the intestines and lead to diarrhea,
and that phosphorus can impair liver function to the point of
causing yellow atrophy   Pertinent to this discussion is the
observation that vitamins, particularly the antineuritic vitamin
B, are stored in the liver and therefore impairment of its func
tion may well impair its capacity for storing vitamins   Finally,
it is well known that for faddist and other neurotic reasons,
or to reduce weight many persons deprive themselves of par
ticular foodstuffs and thrive, or rather fail to thrive, on poor
diets   In fact I have seen instances of polyneuritis on the
basis of food privation   To which may be added the observa
tion of Mellanby and others that even civilized regular and
so-called ' balanced diets   may be deficient in certain vitamins
All this is said not with a view of specifying, much less prov
ing, any particular vitamin defect   although in pellagra and
beriberi it probably is the antineuritic vitamin B and B- or
G which is lacking

alcohol or lead or other toxic substances cause inflammation
Actually they lead to degeneration   Furthermore, if by chance
they affect the brain, as not infrequently happens in the case
of lead and alcohol, they cause encephalopathy and not en-
cephalitis   Hence there is no reason to suppose that they can
or do cause inflammation of peripheral nerves   So, too, it is
well known that lead actually affects the spinal cord more than
the nerves, and it is a question whether diabetes really causes
a true neuritis   Certainly the diphtheria toxin leads to degen-
eration and not inflammation   Attempt has been made to
substitute the term "neuronitis," which is equally unsatis-
factory   All this is said not with a view to caviling or to stress
a not unimportant theoretical point, but because it has defi-
nite bearing on treatment   Not alone is there a difference in
the method of treatment of a degenerative as compared to an
inflammatory process but more accurate understanding of the
underlying pathologic and etiologic factors may lead to better
preventive as well as curative treatment

It is hardly necessary to stress the obvious fact that to treat
intelligently and effectively one must first make an accurate
diagnosis   Ordinarily this is not difficult in the large majority
of cases, but there are times when it is not so easy to say
whether one is dealing with a polyneuritis, radiculitis or cord
and brain involvement   Sometimes only a few nerves are
affected and then it becomes necessary to determine whether
the syndrome is part of a general or the result of a local con-
dition   Furthermore, it is not sufficient merely to make the
diagnosis of polyneuritis, one must find, if possible, the specific
etiologic factor and try to remove or neutralize it   This need
of playing detective, so to speak—and that is what it fre-
quently amounts to—is necessary not alone for the immediate
treatment of the particular case in hand but for preventive
treatment   Spinal puncture to determine the presence of cells,
lead and arsenic, is frequently indicated, and so is a skin
biopsy

In general it may be said that endogenous or exogenous
products which act as systemic poisons cause general, bilateral

degrees of hyperesthesia of the skin   Muscular contractions or even contractures make their appearance later in the course and depend on the type, extent or intensity and duration of the paralyses

The adage about an ounce of prevention is especially relevant to the treatment of polyneuritis   If the opinion is correct that avitaminosis plays some rôle in general polyneuritis of whatever cause, it becomes necessary to pay special attention to diets in individuals who are known or suspected to be exposed to the danger of developing the disease, and foodstuffs rich in vitamins, especially of the B group, should be supplied in large quantities   Fruit juices, vegetables, bread, and milk should be the staple articles of the diet.   It goes without saying that where the possibility of pellagra or beriberi exists attention to diet is of paramount importance   So too are general hygienic measures and attention to the gastrointestinal tract and to general elimination   In the matter of industrial hazards it is obviously imperative to take special precautions   While many dangers have been removed by the consistent application of the principles of industrial hygiene and there has been gradual elimination of noxious elements from industrial products containing them, it still is necessary to harp on the need of cleanliness and wearing of gloves or washing of hands among lead workers, painters and plumbers, for instance   Such old dangers as phosphorus in matches or arsenic in wallpaper or the presence of lead in adulterated snuff tobacco have practically ceased to exist   The addition of lead to gasoline (tetraethyl lead) has made the ubiquitous metal even more prevalent than it is, and so has carbon monoxide become a fairly important threat, and it is a fairly serious question how much the two factors operate to the injury of health in general and of the peripheral nerves or the central nervous system in particular   The control of the excessive use of alcohol and the prevention of chronic intoxication, raise social, economic and psychiatric questions which are not easily answered by the physician alone, but are highly important from the point of view of prevention   It scarcely needs emphasis

that as soon as the first signs or symptoms of intoxication at various occupations make their appearance the worker should at once be removed from the source of poisoning and measures should be taken to prevent further contact Early treatment is important to prevent if possible extensive degeneration of nerve fibers, for once this happens recovery may be incomplete or considerably delayed It may even become necessary to forbid return to the former occupation of individuals who may prove to be particularly susceptible As it is frequently diffi cult and sometimes impossible to ascertain the particular cause or possible source of the polyneuritis, it is advisable to remove the patient to a hospital for intensive study or place him in an environment which is free from the dangers of continued ex posure to noxious agents

The general treatment of polyneuritis is fairly simple This applies to every case, whatever the cause No matter how mild the symptoms, the patient should be put to bed, at least until it is definitely established that the condition is not pro gressive and there is no danger in being up and about In severe cases absolute rest in bed is imperative, and in very severe ones where the question of bed sores comes up (al though this is never so serious as in diseases or injuries of the spinal cord), it may be advisable to procure a water or air mattress This may add considerably to the comfort of the patient In some cases especially in alcohol and arsenic neuritis, there is severe hyperesthesia the skin of the hands and legs and feet is very tender, and patients suffer excruciat ing pains on even light touch It frequently becomes neces sary to keep clothes off the limbs, to see to it that the covers are very light or to use wire cages or cradles for protection Even contact with the air may be painful and so it sometimes becomes necessary to wrap the extremities in soft cotton This will also serve to keep them warm, a measure which may have to be reinforced by outside heat, such as electric lamps sus pended over the limbs or electric pads placed under them Hot air and warm packs may add greatly to the comfort of the patient, improve the circulation and promote recovery Care

should always be taken to avoid the possibility of burns
While polyneuritis represents a lower motor neuron and there-
fore flaccid type of paralysis, the question of contractures must
not be overlooked   They generally make their appearance
late, but attempt should be made to avoid them from the begin
ing   The legs should be extended to prevent contractures at
the knees   Very often there is both wrist drop and foot drop
In the former case a splint padded with cotton may be placed
under the hand and wrist and, if the parts are not too tender,
bandaged so as to be kept in place   In the latter, the feet
should be propped up with sand bags or a padded wire cradle
or plaster cast and kept dorsiflexed   The idea is to support
the weaker, more paralyzed muscles which are opposed by
their less affected antagonists   Unless the feet are protected,
heavy covers are apt to weigh them down and cause or in-
tensify foot drop

   With exceptions presently to be noted, medication is more
or less symptomatic   In some cases none is necessary   Some
patients suffer no pain, in some it is mild, and in others it may
be so severe as to be excruciating and unbearable   The ordin-
ary analgesics may give relief   Amidopyrine, acetphenetidin,
and acetanilid in 5-grain doses, singly or combined with 10
grains of acetylsalicylic acid, to which may be added $\frac{1}{2}$
grain of codeine to the dose, and more rarely morphine
Dover's powder is especially recommended   There is no
grave danger of addiction to codeine but there is to morphine,
and this should be guarded against   Continued warm baths
often act as analgesics, but they are not easy to give in the be-
ginning when the hyperalgesia is marked   Diathermia and
even deep x-ray therapy may be tried when the pains are very
severe, particularly if they are radicular in distribution   For
the restlessness the bromides, chloral and phenobarbital may
be given, and for the insomnia any one of the barbiturate
hypnotics and especially sodium amytal   Although unpleas-
ant to take, paraldehyde in 2- to 4-teaspoonful doses is very
effective, especially in alcoholics, it may be given by rectum
   Strychnine, in fairly large doses, is sometimes given as a

tonic. It is rather doubtful whether arsenic has any particular value as a tonic, and it may actually be harmful when arsenic poisoning exists or is suspected. If cardiac failure is feared it is obviously necessary to administer heart stimulants. The diet, as already indicated, should be rich in vitamins, appetizing and nourishing, and fresh and varied. It may be necessary to whip up the appetite with bitter tonics or other measures. Anemia, if present, should be treated with iron, and liver when indicated. In view of the fact that achlorhydria often exists, dilute hydrochloric in 30 to 40-minim doses should be given with the meals. If the bowels do not move regularly mild cathartics or enemas are indicated. Diuretics are not generally necessary. Oppenheim used to recommend diaphoretics.

The value of electrical treatment is considerably over-estimated. In the beginning when there is hyperesthesia, hyperalgesia and nerve tenderness, it is obviously contraindicated. If there is complete reaction of degeneration it is ineffective. As the object, in any case, is to stimulate a weak or paralyzed muscle to activity the electric current when used should be the one which will cause muscular contraction. For this a mild galvanic current is generally used later in the course, and to avoid pain it is wise to employ large electrodes. Massage is of considerably more value, it should be avoided as long as there is tenderness, and it may be gradually increased in intensity and duration. Active movements are to be encouraged, and passive movements employed when the former are impossible. Bed sores very rarely occur on the heels. They should be treated surgically. Should contractures occur because of neglect or despite care attempt should be made to overcome them by means of passive movements and stretching of muscles. On rare occasions tenotomies especially of the tendo achillis, may be indicated. Sometimes braces and other orthopedic measures may become necessary.

Among the special types alcoholic polyneuritis holds first place. It generally occurs in chronic and consistent types especially whisky drinker. Anorexia, as a rule, precedes and accompanies the polyneuritis. Skin tenderness is

apt to be especially marked and nerve tenderness pronounced
In addition, the patient may suffer from gastro-intestinal up-
sets, more particularly vomiting and diarrhea, and the liver and
the cardiorenal systems may be involved   Insomnia may be
a very distressing symptom, and depression or excitement,
even though there be no outspoken psychosis, may occur at the
beginning or during the course of the illness   Not infrequently
a true Korsakoff psychosis, with marked impairment of mem-
ory, confabulation or filling in gaps with fantastic tales, and
disorientation with impairment of judgment or even delusions
coexist   Acute alcoholic intoxication with hallucinosis is not
usually accompanied by polyneuritis   There is no doubt that
in addition to the alcohol avitaminosis plays a very important,
if not the sole and ultimate, rôle in alcoholic polyneuritis   The
problem in treatment, aside from the general methods, con-
sists in eliminating the alcohol and supplying the dietary de-
ficiency   It is well known that want of vitamin B causes
anorexia (not to mention the fact that alcohol itself causes
loss of appetite by impairing the gastric function), this in turn
prevents ingestion of food and further deprives the patient of
the necessary vitamin, and so a vicious circle is established
The aim therefore is to break this circle   Unfortunately we
have no vitamins at present which can be given parenterally,
but attempt should be made to force food   Yeast or commer-
cial foods rich in vitamins should be added to the diet outlined
above and so should dilute hydrochloric acid   Sedatives are
generally also necessary   It frequently happens that the
dietary treatment has good effect on the mild mental symptoms
Korsakoff's psychosis is apt to persist long after the poly-
neuritis has cleared up   In robust individuals the alcohol
may be withdrawn at once, but sudden withdrawal may pre-
cipitate delirium tremens   Hence when this is feared, or when
the patient's general health is very poor, or when cardiac fail-
ure threatens, the alcohol should be withdrawn gradually or
ven both as a stimulant and sedative if necessary   In any
se it is well to guard against deceit and clandestine drinking
y removing alcoholics to a hospital for strict supervision

For the rest, the treatment is like that of any other poly neuritis. The alcoholic type may last for months and months.

Ginger or jake paralysis is due to triorthocresyl phosphate added to the alcohol. The problem is to detect the adulteration and administer general treatment.

Pregnancy polyneuritis frequently simulates the alcoholic variety, even to the point of being associated with a Korsakoff psychosis. In fact the earliest type of neuritis and psychosis described by Korsakoff was that of pregnancy. These cases are invariably preceded by pernicious vomiting. They are apt to occur in young women between the ages of twenty and thirty and in primiparas. The vomiting may occur either in the beginning or toward the end of the pregnancy. Wherefore, if the slightest symptoms of polyneuritis should make their appearance, it becomes imperative to stop the vomiting or empty the uterus. And since we are most likely dealing with an avitaminosis polyneuritis the treatment must be directed to the specific cause and attempt made to force food.

It is questionable whether lead neuritis is a true poly neuritis. It is frequently selective so far as the peripheral nerves are concerned, often involving the radial nerves and giving rise to wrist drop but frequently sparing the brachioradialis and even the triceps, and is essentially motor in character so that pains are commonly absent. The probability therefore is that we are dealing with a segmental lesion, and it is true that the spinal cord is affected. We may leave out of consideration the occasional coexistence of lead encephalopathy with the accompanying mental changes of an organic nature. The treatment essentially consists of prevention, and a blue line on the gums, constipation, lead colic, anemia or stippling of the red cells should give ample warning. Sometimes none of these exist and it becomes necessary to examine the urine and feces and spinal fluid for lead. Special care as to the cleanliness of apparatus and chemical purity of reagent is necessary because of the wide-spread occurrence of lead. A way for bio-spectroscopic study to determine the presence of

lead in the skin is regarded as a more accurate index than the other tests In view of the fact that lead is so prevalent and that tetraethyl lead is now so commonly employed, it is a question whether the mere presence of lead in a given case is the only cause, but the answer obviously depends on the quantity found—and on the response to treatment Sometimes lead deposits can be demonstrated in the bones on x-ray films, especially in the epiphyseal lines in children

The treatment of lead neuritis consists of detoxication and of special diets The former must not be carried out too rapidly The lead is deposited in the bones and is eliminated very slowly Magnesium sulphate used to be given both as a cathartic and as a chemical to combine with the lead and facilitate its elimination A more specific treatment recommended is the administration of ammonium chloride in 1-Gm doses, with each meal, increased every other day to 6-Gm doses Ammonium phosphate in similar doses may be given alternately with the ammonium chloride The injection intramuscularly of one ampule of colloidal sulphur, up to eight doses, every three days is also recommended Calcium lactate or gluconate in gram doses with meals and alkalis have considerable value In addition, dilute hydrochloric acid is given before meals, and the patient is made to drink ten to fifteen glasses of metal-free water daily The food should be seasoned with chemically pure salt, preserved foodstuffs and those canned in metal containers should be avoided, all foods, especially fruits, should be fresh, sugar is to be avoided and honey substituted, alcohol should not be partaken of, and sea food is not to be eaten All food should be prepared in iron or enameled cooking utensils and kept in glass or porcelain containers Obviously the meticulous care in the preparation of the food has for its object the exclusion of all possible sources of lead contamination, but it may not be easy to carry it out in all its details More important is the prevention of further intoxication from the original source and the elimination of the lead retained in the body Owing to the tendency to constipation cathartics are necessary Periodic examination of the urine

and further spectrobioscopic examination of the lead content of the skin will indicate the extent of the elimination and the measure of the success of the treatment

Thallium acetate neuritis is caused by the use of depilatory pastes containing it. Their use should be forbidden. The poison causes hyperemia of the meninges, chromatolysis of ganglion cells, and degeneration of nerve fibers. In addition to involvement of the peripheral nerves causing polyneuritis and of the cerebral nerves causing various palsies, there is also clouding of consciousness, confusion, disorientation, mental deterioration, myoclonic and choreic movements, and convulsions. The treatment is essentially eliminative and palliative and follows that outlined for general neuritis.

Arsenical neuritis has become comparatively rare. It used to be much more common when it was used rather extensively in industry and Fowler's solution used to be given regularly for chorea. Evidently the ingestion of arsenic or its inhalation is more conducive to polyneuritis than its injection intravenously. Taken by mouth it may cause diarrhea and vomiting, and coughing and edema of the eyelids. Except for the fact that affection is apt to be painful and accompanied by sensory changes the picture does not differ from that of any other neuritis. However there may be present pigmentation of the skin and exfoliative dermatitis. The arsenic can be found in the urine and spinal fluid and can be demonstrated in the skin, hair and parings of nails. As arsenic is eliminated rather rapidly and well, all that is necessary is to stop the use of the drug and treat the general condition. When more rapid elimination is desired, ½ Gm of sodium thiosulphate in sterile water may be injected intravenously every few days.

Mercury polyneuritis, which is very rare, is like any other neuritis except that it is accompanied by marked gingivitis, coated tongue, foul odor from the mouth and gastro-intestinal symptoms. The treatment consists in stopping the administration of the drug and of general measures.

Diphtheritic polyneuritis has become very rare, thanks to the Schick test and the use of toxin antitoxin. Its preven-

tion therefore depends on the prevention of diphtheria and its prompt treatment if it develops   When neuritis, which is a true toxic-degenerative process, does occur it is apt to appear after the acute throat condition has cleared up, within two or three weeks   It may follow mild and overlooked cases   Neuritis has also been described following diphtheritic wound infection of the extremities   The paralysis affects the uvula and palate and may involve other bulbar nerves, such as the laryngeal and the spinal accessory   At times there is widespread involvement of the peripheral nerves, with paralysis of the extremities   Very characteristic is paralysis of the ocular nerves and especially of visual accommodation   Extremely dangerous and often fatal is the involvement of the vagus and of the phrenic nerves, but death in diphtheria may be due to myocarditis   It is important therefore to be on the lookout   Aspiration pneumonia from paralysis of the glottis is another serious danger in diphtheritic paralysis   The treatment, aside from prevention, is supportive, and consists of measures to tide over the immediate dangers, and of the general care given in any other form of polyneuritis

Diabetic polyneuritis is more likely an expression of cord involvement, it does not run parallel with the severity of the diabetes, it is as a rule not very severe, often clears up on general dietary treatment, and demands comparatively simple measures   If the suspicion is correct that the neuritis is due to vitamin deficiency aggravated by the need of withholding, because of diabetes, of the foodstuffs rich in vitamins, then we are faced with a vicious circle from which there seemingly is no escape   Fortunately this is not so   With the use of insulin one may be permitted certain foodstuffs which otherwise might be forbidden   Diabetic neuritis may recur

Infectious polyneuritis belongs in a special class by itself and possibly represents the only true type of inflammation of the nerves justifying the term neuritis   It is probable that in those cases we are dealing with a general disease of the nervous system, either part of or akin to the meningomyeloradiculitis of epidemic encephalitis   In any case the syndrome is char-

cterized by fever, by increase of cells in the spinal fluid, which betrays an inflammatory reaction, and by the occurrence of cranial nerve paralysis. Bilateral facial neuritis or diplegia may occur, and the ocular nerves are often involved. The disease, which is possibly due to virus infection, is much more acute and more serious than other forms of polyneuritis and may terminate fatally. The treatment in the beginning, therefore, is that of any acute infectious disease. Once the acute symptoms have subsided the residual peripheral nerve palsies are treated like any other form of peripheral neuritis. There is such a condition as an ascending mono- or polyneuritis from a local infection. It is extremely rare and therefore difficult to foretell or to prevent. The rare occurrence of neuritis following injection of tetanus antitoxin is equally difficult to predict or prevent. It is a question whether puerperal polyneuritis is due to infection or to metabolic disturbances. The pregnancy polyneuritis already alluded to is certainly not due to infection unless this happens to be intercurrent. In any case the syndrome is like that of any other neuritis; the prognosis is generally good and the treatment that of other forms. The polyneuritis occurring in dengue fever is characterized by involvement of the cerebral nerves, especially the vagus, and by marked asthenia.

Erythredema polyneuritis, also known as acrodynia, pink disease and dermatopolyneuritis, occurs generally in young children in the form of small epidemics. It begins gradually with apathy and anorexia or restlessness and insomnia and is followed by cutaneous irritability, redness and swelling of the face, fingers and toes and desquamation of the palms and soles. The cutaneous sensation is impaired and the reflexes are lost. The affection lasts from two to eight months and generally ends in recovery. In fatal cases necropsy shows true peripheral neuritis in addition to inflammatory changes in the central nervous system. It is not known whether the disease is due to an infection or is the result of food deficiency. Aside from general treatment attempt is made to force foods rich in vitamins. Local soothing applications are neces-

sary for the itching and other skin manifestations, sedatives are given for the irritability and the insomnia, and the neuritis is treated like any other type

Carbon monoxide polyneuritis comes on after the acute intoxication is over and is apt to involve single nerves, although it also is bilateral and may affect the optic nerves However, more important and more serious when it occurs is the involvement of the basal ganglia and other parts of the brain with the resulting syndrome of paralysis agitans and the mental changes ranging from slight memory impairment to amnesia, psychotic manifestations and mental deterioration The treatment is purely symptomatic The mental changes and particularly the paralysis agitans syndrome are apt to persist, the neuritis may clear up

Leprous polyneuritis is merely one manifestation of general leprosy Aside from the trophic and other skin changes the nerves may be thickened and palpable Single nerves are asymmetrically involved Obviously the demonstration of the Hansen bacillus proves the diagnosis The treatment is with chaulmoogra oil or its esters, but must be essentially preventive

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SALT THERAPY IN ADDISON'S DISEASE

THE first step in the discovery of the value of sodium chloride in the treatment of acute adrenal insufficiency dates back to the work of E J Baumann and S Kurland[1] These workers observed that sodium in the blood serum of adrenalectomized rabbits was decreased by 15 per cent and the chlorides were decreased by 5 per cent

Marine and Baumann[2] then found that they could prolong the lives of adrenalectomized cats from five to fifteen days by daily injections of 50 cc of normal saline. That the sodium, rather than the chloride, was the important ion was demonstrated by their ability to keep cats alive for an average duration of 12.8 days with the equivalent amounts of sodium acetate

moval of one gland caused no change, bilateral adrenalectomy was attended by an immediate decrease in the sodium of the blood serum, with an increased sodium output in the urine The serum chlorides showed a corresponding drop with an increase in the urine chlorides   The potassium and calcium balances were undisturbed   Harrop *ct al*[5] confirmed these findings on bilaterally adrenalectomized dogs

The definite connection between sodium and dysfunction of the adrenal cortex was later clearly shown by Loeb[6] He followed the response of a patient with Addison's disease to the feeding and withdrawal of sodium chloride over a period of six months   That a definite correlation exists between the clinical condition of the patient with Addison's disease and the changes in concentration of sodium in the blood was demonstrated   The symptoms of severe adrenal insufficiency in his patient were relieved by the administration of sodium chloride, the improvement lasting for a period of five months, during which time she ingested 7 Gm of salt daily in addition to her diet   Furthermore, a withdrawal of salt resulted in a recurrence of symptoms of severe insufficiency which were again treated by the administration of sodium chloride with the result that the patient became symptom free in nine days

The level of serum sodium paralleled the clinical picture, the figures being 108 milli-equivalents per liter one week after admission, 133 following administration of salt for one week, 140 after three and a half months of continued salt therapy, 127 after seven days on a salt poor diet, and 138 after the reestablishment of salt therapy

These observations "associated with the evidence that adrenalectomy in dogs causes a striking loss of sodium through the kidney, make it reasonable to assume that the beneficial effects of sodium chloride upon the symptoms of adrenal insufficiency in this patient were due to the replacement of sodium lost from the body "

Working with Atchley, Loeb[7] sought to explain the mechanism of salt in the treatment of Addison's disease

The symptoms of acute adrenal insufficiency closely parallel

the syndrome produced by a continued drain of salt and water from the blood stream and intercellular spaces, namely weakness, prostration, falling blood pressure, nausea and vomiting a feeble and rapid pulse, dehydration, and shock. These investigators wondered whether the level of serum electrolytes in Addison's disease resembled that of high intestinal obstruction, diabetic coma, or cholera. They found that the blood of patients with Addison's disease contained even less sodium than is found in patients suffering from dehydration and shock due to other conditions. In view of the fact that salt has been found to be of therapeutic value in cholera, diabetic coma, and high intestinal obstruction, it certainly seemed indicated in a condition exhibiting such a striking similarity in symptoms.

From their clinical observations and from animal experimentation, they hypothesize that 'the adrenal exerts a regulatory effect upon the sodium metabolism through the medium of the kidneys, and that when the adrenals are removed the rate of sodium excretion is abnormally increased to the detriment of the whole organism. They further conclude that although salt feeding will not maintain life for more than three weeks in completely adrenalectomized animals, 'numerous physiologic and clinical disturbances of acute suprarenal insufficiency may be corrected by the ingestion of large amounts of sodium chloride without any other therapeutic measures.

Harrop in an excellent review of the disease and current methods of treatment reported a case in which diets high in salt content produced great clinical improvement. These cases received no cortex. He also proposed the withdrawal of salt from the diet as a good though somewhat dangerous diagnostic test for Addison's disease.

four hours   The improvement was maintained on 10 Gm sodium chloride daily in 2-Gm doses in milk   In this case, however, only a small rise in the serum sodium was observed in spite of the fact that the patient's symptoms apparently improved enormously

None of the investigators regards the use of sodium as curative and although in the few cases treated exclusively by this method, universally good results have been reported as far as symptomatic relief is concerned, one cannot predict the length of time a patient can be maintained by means of salt therapy alone

The following case seems to throw some light on the question

In a patient whose symptoms dated back only six months prior to admission, intensive salt therapy was ineffectual in prolonging life to any great extent, as compared with cases previously reported   Although both sodium and chloride of the blood serum were decreased on the salt poor diet and were satisfactorily increased by high salt intake, although the blood pressure was somewhat raised and the patient recovered from one attack of bronchopneumonia, he did not show any marked amelioration of his other symptoms and died six weeks after admission   At autopsy it was found that tuberculosis had so extensively destroyed both adrenal glands that no normal glandular tissue could be demonstrated

The details of the case history are as follows

The patient was admitted to New York Hospital December 4, 1934

First admission of a thirty-five-year-old male of Norwegian extraction complaining of fatigue, easy exhaustion, anorexia and vomiting of six months' duration

Family History—One brother died of tuberculosis when patient was five years old and one brother died of tuberculosis when patient was seventeen years old   Patient had a one-year exposure to the second case and lived in the same house with the first

Personal History—Measles and whooping cough in childhood—influenza in 1918   Intermittent cough for past fifteen years   General health was good   At the age of twenty-eight he had a chancre which was treated over a period of two and one-half years with arsphenamine, bismuth and mercury   At the conclusion of the treatment he was told that his blood and spinal fluid were negative

Present Illness—The complaints of easy fatigue exhaustion and dyspnea on exertion anorexia nausea vomiting and low back pain had been gradually increasing during the six months prior to admission. Three months ago he was treated with liver but was not able to tolerate it and derived no benefits. Patches of a dirty yellow color and brown patchy pigmentation of the lips were noticed by the patient and friends two to three months ago. He was in another hospital for one week during this time but signed himself out. During the six months his weight dropped from 190 to 135 pound. He was especially fond of salty foods, disliking sweets and condiments.

Physical Examination—Temperature 36.8 C. Blood pressure 90/60 mm

The essential findings were. Grayish tan pigmentation on hands, wrists and neck and below left clavicle. Dark gray pigmentation was noted on lips buccal mucosa and hard palate.

The patient seemed mentally dull. His hearing was impaired and he had marked oral sepsis.

The lungs were normal.

The heart sounds distant with a soft systolic murmur at the apex.

The liver edge was palpable 1 cm below the costal margin on deep inspiration.

There was weakness and wasting of the extremities.

There was a chancre scar on the penis and scar of bubo in left inguinal region.

Laboratory Findings Urine. Specific gravity 1.01 to 1.018. R acid. No albumin. No sugar. Microscopic. Occasional white blood corpuscles. Maximum concentration 1.020.

Blood Hemoglobin 88 per cent. Red blood corpuscles 4,830,000. White blood corpuscles 7000 to 13,000. Differential. Adult polymorphonuclears 53 per cent. Immature polymorphonuclears 3 per cent. lymphocytes 3 per cent. monocytes 12 per cent. eosinophils 7 to 8 per cent. basophils 1 to 2 per cent.

Serology Kline diagnostic 4 plus. Wassermann negative.

Sedimentation rate 1.9 (normal up to 0.4)

EKG   Left axis deviation and low amplitude and splitting of the QRS complexes

x-Ray   Flat plate of the abdomen showed a calcified mesenteric gland, but no calcification of the adrenals   The chest plate showed increased peri bronchial markings

Tuberculin   0 1 mg 3 plus

Course   As a diagnostic procedure the patient was put on a salt free diet for three days   There was some increase in the symptoms and the blood pressure fell to 66/50 mm   Salt was then forced by mouth, vein and clysis Most of the salt taken by mouth was vomited

Electrolyte studies

	Patient's normal level	after 3 days salt poor	after 5 days forced salt
Sodium	128 5 m.eq	125.8 m.eq	135.0 m.eq
Chlorides	91 0 m.eq	85.0 m.eq	101 0 m.eq
CO_2	62.2 m eq	62.2 m eq	

The patient was then given 15 to 50 Gm sodium chloride a day—averaging 25 Gm a day

On the second day of the forced salt therapy, December 18, 1934, the temperature rose to 40.2° C , pulse and respirations were increased   The patient became irrational and uncooperative but had no complaints   Examination of the chest was at first clear but subsequently rales appeared in both chests and dulness and diminished breath sounds at the right base posteriorly An x-ray of the chest at that time showed a pneumonic process on the right The high fever and pulse persisted for almost a week then gradually returned to normal, with clearing of the signs in the chest   From January 2nd to 9th he was up in a chair nearly every day for ten to fifteen minutes

A daily salt intake of 20 to 30 Gm was instituted by diet and enteric pills and a high caloric intake   His general condition improved slightly but he was still so weak he could not sit up unaided   He was irrational and restless much of the time   About January 9th the caloric intake began to fall with the patient vomiting one to three times daily and refusing food   The blood pressure which had risen to about 95/60 mm again fell to 76/60 mm He became drowsy   The salt intake was still kept between 20 and 25 Gm daily

On January 14th the temperature rose to 39° C (by rectum) and remained at about that level   Respirations became rapid and shallow, pulse weaker, the patient comatose   He expired quietly on January 16, 1935

Clinical diagnosis   Addison's disease due to

Tuberculosis?
Simple atrophy??
Syphilis???

Autopsy findings   (Significant)   *Gross*   The lungs showed a fibrous scar of the left apex with a few calcified nodules in the lungs and tracheobronchial lymph nodes   Bronchopneumonia of both upper lobes, congestion and edema of both lungs were the other findings

The right adrenal weighed 100 Gm., the left 50 Gm   The capsules were thickened, somewhat adherent to the surrounding tissues and on section no

cortical or medullary adrenal substance could be identified. The entire tissue was composed of irregular islands of yellow soft caseous material and bluish white fibrillar connective tissue in which there were a few firm nodules

Tubercles in peripancreatic lymph nodes spleen and liver

Calcified nodules in peripancreatic lymph nodes

Hemosiderosis and anthracosis of spleen which weighed 310 Gm

Hyperplasia of abdominal lymph nodes

Lymphatic tissue of terminal ileum and colon was swollen and projected into the lumen of the intestine with small yellow nodules scattered through it

Microscopic Two sections of the adrenals were prepared In neither section was there any evidence of cortical or medullary tissue from the adrenal glands The center of each section was occupied by a large area of acidophilic caseous material, this was surrounded by a large fibrous tissue mass in which there were small typical giant-cell tubercles On microscopic examination of the swollen area of the small intestine the entire mucosa was found to be infiltrated with large numbers of lymphocytes—the whole submucosa being converted into a Peyer's patch

Bacteriological Postmortem cultures of the lungs and spleen were sterile and negative for acid fast bacilli Postmortem cultures of the adrenal glands were positive for acid fast bacilli

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TREATMENT OF ITCHING IN HODGKIN'S DISEASE

ITCHING is well known to be a common symptom in Hodgkin's disease. Those who follow comparatively large numbers of cases throughout their course observe that in a high proportion, at least 20 per cent itching is present at one time or another. Complicating diseases, probably having no direct relationship to the Hodgkin's process, such as urticaria, eczema, scabies, epidermophytosis and diabetes, may be the cause of the itching. Naturally, if it appears obvious that the itching is due to some unrelated condition the treatment to be given is that which is appropriate for the disease in question. However, since Hodgkin's disease may itself produce lesions that resemble, or perhaps are identical with some of the dermatoses just named, and since in that case such lesions may not yield to usual dermatological measures it is important to realize that relief may be obtained only when the Hodgkin's lesions have been sought out and made to regress.

We have then to consider the various ways in which Hodgkin's disease becomes directly responsible for itching alone or itching lesions of the skin. The most common way is not explainable at present beyond the statement that it seems to be one of the general toxic manifestations and that it is a warning that active Hodgkin's disease is present somewhere in the patient's body, and probably to a considerable extent. This active disease must therefore be found if possible, and irradiated.

The location of the main foci of active disease may be fairly obvious in the earlier and intermediate stages. When

external or palpable internal masses, or foci that can be demonstrated roentgenologically, as in lungs, gastro-intestinal tract or bones, are lacking, it is well to recall how much more disease is usually found at autopsy in the mediastinal and retroperitoneal nodes than could be demonstrated during life, and to assume that these areas need further irradiation   In the terminal stages one is justified in suspecting also a pronounced diffuse involvement of the marrow of the bones   At such a stage, however, one is frequently inhibited from giving any considerable amount of radiation because of severe depletion of the blood   Transfusions may temporarily reinforce the patient's blood enough so that some further treatment may be given   Experience with Heublein's method of prolonged low-intensity irradiation of the entire body in suitable doses, and with methods of intermittent irradiation of the entire body, or large sections of the body, has demonstrated that by those means relief from itching, as well as other symptoms of Hodgkin's disease, may sometimes be obtained in cases in which examination fails to disclose localized lesions, or in which the process is so generalized that treatment by local irradiation seems an almost endless task

This general itching, ascribable at present only to some unknown toxic mechanism, may be so intolerable that the patient is unable to keep from scratching, particularly during his fitful sleep, and becomes so covered with scratch marks that his appearance is that of severe infestation by scabies   Persistent treatment by ultraviolet light seems to relieve some such cases if the exposures are given so as to produce eventually a good tanning without erythema   Large doses of calcium by mouth, or injections of calcium intravenously, may contribute to relief   Occasionally the use of bromides or other sedatives such as phenobarbital may temporarily help to allay itching   The use of the customary calomine lotion with 2 per cent phenol has been disappointing

Attention to the details of bathing is important for these patients   Many have an abnormally dry skin   They are advised to bathe with mild soap, perhaps one of the superfatted

soaps, and warm water, without much rubbing during bathing or drying to be sure to rinse off all soap and if the skin is dry, to apply olive oil or almond oil after drying They are usually advised to bathe in the morning as the donning of clothing immediately after a bath tends to prevent undue drying of the skin The customary baths with bicarbonate of soda or bran seem useless in most of these cases, are messy, and less advantageous than a daily soap bath, which keeps the skin free of accumulations of dead layers of epidermis, secretions, and exudates As in sunburn, relief may be obtained by following these rules for bathing, and by applying a good quality of unscented talcum powder all over the body, to diminish friction by clothing Menthol baths may be useful

When Hodgkin's disease causes jaundice, as by pressure of enlarged nodes at the portal outlet, relief may wait upon reduction of the adenopathy at that site

There are now to be considered certain local causes of itching in Hodgkin's disease Most common of these local causes are the various visible lesions of the skin that may be directly associated with the general process Among these are xeroderma, erythroderma localized eczematoid patches, pruriginous lesions, and urticaria, which sometimes as in a recent case, appear to progress to a condition suggesting early mycosis fungoides All of these may be complicated by the general itching and scratch marks described above The more local ized lesions such as the eczematoid and pruriginous dermit oes, may yield promptly and lastingly to small doses (100 to 200 r) of low voltage unfiltered or very lightly filtered x rays

Actual Hodgkin's granulomas of the skin are rare and seldom itch to an annoying degree They will of course yield quickly to small doses of lightly filtered low voltage x rays

Some itching, along with the more common burning pain may precede and accompany the appearance of herpes zoster, which occurs in a good percentage of cases of Hodgkin's disease The symptoms of herpes may be relieved by the currently popular treatment of painting the entire lesion with collodion and by x ray treatment —superficial therapy for the

vesicles, and a moderate dose of deep therapy for the appropriate nerve root level

Another occasional cause of localized itching is involvement of a particular sector of nerve roots or trunks, and the itching may then be a forerunner or an aftermath of pain   In such a case, treatment is irradiation of the affected segment of the nervous system

In spite of all the suggestions given here, it is only fair to confess that in a number of cases attempts at relief of itching in Hodgkin's disease have been only partially successful

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PRURITUS AND ITS TREATMENT

"PRURITUS" cannot be exactly defined Nor can the sensa
tion of itching be adequately described Perhaps the best
definition is still the rather naïve one first given by Hafenreffer
about two hundred years ago, which reads ' Pruritus est tristis
sensatio, desiderium scalpendi excitans   " ("Itching is
that disagreeable sensation [of the skin—authors] which ex
cites the desire to scratch   ")

Pruritus and its treatment form one of the most difficult
chapters in dermatology , and, perhaps, in all medicine To
date, no characteristic organic changes have been demonstrated
in itching as contrasted to nonitching areas, nor in the struc
tures serving these areas Thus, the microscopic morphology
of pruritus is, as yet, completely obscure It has no clinical
morphology—since itching frequently occurs on areas without
visible objective changes

who go through twenty-four hours without conscious or sub
conscious rubbing or scratching, whether it be on arising in
the morning, or undressing at night, following changes in en-
vironmental pressure or temperature, or, quite subconsciously,
while talking, reading, or working

One of the early discussions on the subject emanates from
Jacquet   This author considered that the sum of sensations
coming from the integument constitute an harmonious whole,
and that, when this harmony is disturbed, pruritus may make
its appearance   This disturbance of harmony may be effected
by an almost infinite number and variety of causes

This disharmony may lead to different sensations, such
as cold, heat, tactile sensations, pains, or itching   Certain
stimuli seem adequate to produce certain sensations, prob-
ably by stimulating certain specific end-organs to a greater or
less degree   It is the consensus today that the *end-organs
and nerve apparatus recording pain are also those which record
itching* *

While we have no definite scientific proof, certain of our
observations lead us to believe that the entire sensory appar-
atus, including that for heat, cold, and tactile sense, participates
in the production of the sensation of itching   Nevertheless, it
is evident that the sensation of pruritus is primarily dependent
upon and is transmitted by the same sensory apparatus which
serves for the sensation of pain *

The opinion that itching is largely a subpain sensation is
based primarily upon the following observations

1 Itching cannot be produced in analgesic areas, *i e ,*
those in which pain cannot be elicited, even though the tactile

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* The most modern neurologic concept holds that the same end-organs
are capable of registering temperature, tactile and pain sensations, and states
that the type or quality of sensation is dependent on the degree of stimulus
This concept coincides with our observations that itching is the result of certain
minute stimuli, which if increased, or when applied under different conditions,
are capable of producing sensations of temperature, of pain or of touch   It
also helps to explain why pruritus can be relieved by the mutation to any one
of these three sensations

Unfortunately we cannot in this paper discuss the position of pruritus in
the newer classification of vital and gnostic sensations

sense in these areas be normal, *vice versa* itching can be produced in areas in which the pain sense is present, but the tactile sense is absent

2 Similarly, the thermal sense has been shown to be dissociated from the sense of itching

3 No demonstration of independent sensory points for itching has been made On the contrary, the sensory points for itching seem to coincide in distribution with the sensory points for pain (v Frey)

4 The reflex time for pain and for itching is identical

5 During anesthesia, the susceptibility to pain and to itching disappears almost simultaneously

6 Hypalgesic areas, *i e*, those skin areas with reduced sensitivity to pain, respond with a sensation of itching to a stimulus ordinarily adequate to produce pain

As stated, the sum of these and similar observations makes it appear highly probable that the sensation of itching is primarily a subpain sensation, and further observations have shown that pruritus is probably a subpain sensation of the diffuse, not very accurately focussed more unpleasant, *protopathic* type of *Head*, rather than of the accurate, sharply localized, *epicritic* type of this author We are in complete agreement with Rothman in the statement that scratching, pinching, slapping, vigorous rubbing, etc, relieve itching by producing pain That is, the patient endeavors to replace the extremely disagreeable protopathic feeling by creating a less disagreeable and therefore preferable epicritic sensation *

Particularly in view of the modern vogue for statements regarding the role of the autonomic nervous system in pruritu

we should like to emphasize that we are here distinguishing sharply between the actual *recording* and *transmission* of the sensation of itching on the one hand, and, on the other hand, the *susceptibility* which governs the degree of response to stimuli producing this sensation (irritability) While the actual sensation of pruritus can be considered as recorded and carried by the pain-nerve pathways, the susceptibility to this sensation (threshold of irritability) seems to be dependent, to a certain and perhaps great degree, upon the vegetative nervous system Thus, when the autonomic nervous system is disequilibrated (vagotonia or sympatheticotonia), the threshold is lowered and severe pruritus may be elicited by normally innocuous stimuli, such as, for example, slight friction or changes of pressure (clothing, etc), slight changes of temperature (undressing, etc), and mild chemical stimuli (soap, etc)

While the perception of pruritus thereby becomes dependent upon the state of the autonomic nervous system, the autonomic nervous system is, in turn, dependent upon the psyche and psychic changes, so that the psychic factor in pruritus becomes important in two distinctly different ways First, as the receptor of the sensory impulses from the skin, which may be disregarded by the normal psyche but registered as itching in abnormal psychic states, and, second, through a psychogenic disequilibration of the autonomic nervous system of the skin, which renders the sensory end-apparatus sensitive to ordinarily subliminal stimuli Thus, in two different ways, through alterations of the psyche, ordinarily nonprurigenic stimuli may produce itching, or itching of slight degree may become intensified to unbearable proportions

In both the manners described, morbid mental conditions (psychoses, psychoneuroses, emotional traumata, etc) can produce generalized or localized pruritus

While our statement has reduced the underlying mechanisms in psychogenic and neurogenic pruritus to the simplest terms, in reality these intricate mechanisms are dependent upon variations in the extremely complex interrelationship of a great number of factors Thus, hormonal disturbances are

important factors and influence both the psyche as receptor and as a regulator of the autonomic nervous system, as well as exerting influences directly upon the vegetative nervous system. Similarly, local and general chemical changes, for example, the colloidal states and the ratio of anions to cations such as K, Mg, Na, Ca, and ammonium ratios, the chloride, bromide, and iodide ratios, and the presence or absence of other electrolytes—are all of importance in exerting direct and indirect influences upon both peripheral and central irritability.

It is not surprising, therefore, that in this intricate dovetailing of manifold causes, each capable of influencing, and being influenced by all the others, a slight aberration in one direction should give rise to vicious circles which may continue to favor itching of ever increasing severity and of long duration. A simple case in point would be that in which a local hematogenous chemical irritant produces itching, the itching elicits the scratch reflex, the scratching produces hyperemia, the hyperemia carries more of the irritant chemical to the scratched area, and the vicious circle is started. To this simple cycle must be added a large number of contributory factors, such as the local and general disturbances of the autonomic nervous system, the fixation of the psyche upon the pruritic area and the thereby increased readiness to perceive itching, and the local alterations of the skin which may give rise to a sort of skin memory (mnemodermia of Jacquet and Richet's mémoire élémentaire de la peau')

The therapy of such itching would be almost hopeless were it not for the fact that it may sometimes suffice to remove but one factor in the genesis of a given pruritus, and by this means interrupt a vicious circle and effect a cure

for this reason that *psychotherapy* must play such an important rôle, not only in *psychogenic* pruritus, but in the *treatment of all itching, regardless of its genesis*

When one considers the enormous and baffling complexity of the local and general, and of the central and peripheral factors which contribute to the production of pruritus, it cannot be astonishing that accurate information regarding the pathogenesis of itching should be difficult to obtain   Moreover, there is but little accurate knowledge available, not only concerning the functional mechanisms, but also regarding the anatomy of itching

Despite this paucity of accurate information, most observers nevertheless agree that the nerve ends which record and carry the itch sensation may be presumed to lie very superficially, usually within the epidermis itself, for areas denuded of epidermis do not itch

Some areas of the mucous membranes—tongue, cheeks, conjunctivae—may itch, but rarely   On the other hand, as above stated, the transitional mucosae—anus, vulva, lips, nares, etc —are frequent sites of pruritus   There is no itching of internal organs, nor of the internal mucous membranes

It is evident that there are many different kinds of pruritus, and that, in some, the itching may be more superficial, in others, deeper   For, while in certain itching eruptions, such as *neurodermatitis, chronic eczema, leukemic pruritus*, etc , bloody and crusting scratch marks are the rule, in other equally pruritic dermatoses, such as *urticaria* and *lichen planus,* visible scratch marks are rarely found   In one type of pruritus the patient scratches superficially, or only rubs, in the other, he ruthlessly digs through the skin with his fingernails or with any other available object

It is interesting to consider the itching caused by lice from this viewpoint   *Pediculi vestimentorum* cause itching which almost invariably leads to parallel scratch marks   In fact, these marks are so characteristic and of such constant occurrence that they form an almost pathognomonic diagnostic criterion   On the other hand, *pediculi capitis* occasionally lead

to the production of scratch marks, and *pediculi pubis* practically never lead to the production of visible evidence of scratching, no matter how severe the pruritus

Unfortunately, nothing is known, as yet, as to the histopathology of itching, for the demonstration of nerve structures within the epidermis is tedious, difficult, and often impossible

or a connection with any other pathologic condition, that the case may be relegated to the group comprising idiopathic pruritus

The causes of *secondary pruritus* may be subdivided as follows

I *Physical causes*—heat, cold, changes in temperature or pressure, superficial contact with certain objects, such as crawling insects, hair, feathers, clothing, etc (while a short, superficial contact with certain substances normally produces *"tickling,"* a sensation different from and not to be confused with *itching*, it has been shown that repeated and persistent superficial contact eventually produces itching even in normal persons)

II *Chemical causes*—on the one hand, primarily and intrinsically pruriginous substances, and on the other hand, those which produce itching through sensitization

(*A*) *Exogenous substances*

1 Stinging nettles, itch-powder (mucuna pruriens), mustard-seed oil, etc

2 External medicaments—sulphur, mercury, benzocain, nupercain, butesin, etc (often due to sensitization—allergy)

3 Other environmental substances—soaps, clothing, dyes, occupational contacts, air-borne substances, micro-organisms—parasitic and saprophytic, and larger organisms—parasitic and saprophytic, etc (often as allergic manifestations similar to the itching in experimental anaphylaxis)

(*B*) *Endogenous substances*

1 Substances ingested or in other ways administered enterally or parenterally

(*a*) Drugs of special importance are   Morphine and its derivatives, quinine and related drugs, analgesics, sedatives, soporifics, antipyretics, laxatives, arsphenamine, metallic salts, foreign sera, vaccines, etc , etc

(*b*) Foods, especially common sensitizers, such as eggs, wheat, milk, fish, cheese, and foods high in purine derivatives

(*c*) Inhaled substances, especially pollens, dust, silk, orris

root, other vegetable and animal matter in the air, tobacco
derivatives, volatile substances in perfumes, etc

(d) Substances originating from foci of infection or of
infestation—bacterial and fungus products, and products of
intestinal and other parasites, etc

(e) Normal metabolites (either because present in in
creased concentration, or perhaps because the patient has be
come hypersensitive to those present in normal concentrations)

(f) Abnormal metabolites (it is possible that the itching
associated with such divergent conditions as "auto-intoxica
tion," thyrotoxicosis, and other endocrine changes, e g, men
struation, pregnancy, the climacterium, with carcinomas,
blood dyscrasias, Hodgkin's disease, liver disease, kidney dis
ease, pancreatic disease, diabetes, etc must, in many instances,
be included in this group)

III *Psychogenic and Neurogenic Pruritus*—(A) Neuro-
genic and organic (itching, such as found in tabes, zoster, or
when a tumor or mass presses upon a nerve, etc.)

(B) Neurogenic and functional (itching associated with
'neuralgias without organic basis etc)

(C) Psychogenic and organic (as in tumors of the brain
brain infections organic psychoses etc)

(D) Psychogenic and functional (itching presumptively
due to disturbances of the psyche without known organic
bases—as found under emotional influences such as fear,
anger, suspense or under nervous strain" etc or, as occur
ring in the functional psychoses and in psychoneuroses or in
suggestion and autosuggestion in hypnotic states, in hys
teria etc)

logically fully developed cases of the above mentioned usually pruritic skin diseases to make it apparent that the skin lesion itself cannot be the *cause* of the pruritus   We have seen cases of generalized urticaria, of lichen planus, and even of scabies, in which there was no itching   On the other hand, certain dermatoses—such as psoriasis and syphilis, leprosy and tuberculoderms—may itch, even though only very exceptionally This lack of obligatory association of pruritus with the existence of a certain type of skin lesion makes it apparent that, in the itching cases, the lesion itself is not the *cause* of the pruritus, but, rather, that both itching and lesions are produced by an underlying cause or causes

It is, therefore, apparent that our classification of pruritus accompanying manifest skin lesions (IV) is not, like the foregoing categories, a *causal* classification   For example, the itching in urticaria, when *causally* classified, would, in most cases, fall within the group of chemical endogenous or exogenous causes, that of eczema, prurigo, and neurodermites, within the same categories, that of scabies, within the chemical or physical exogenous causes, and that of the leukemias, Hodgkin's disease, etc , would, presumably, fall within the group caused by endogenous substances

TREATMENT

Causal treatment of all the above forms of pruritus is, obviously, the most logical one, and that which is the most promising of permanent success   This treatment, consisting of the removal of the cause or causes, must of course be just as varied as the causes themselves, and a discussion of this therapy would embrace a major part of dermatologic, medical, and surgical therapeutics   We must here limit ourselves to the statement that the cause must be sought for exhaustively in each and every case, and that, when discovered, the cause must be eradicated or combated by all available methods of therapy

While some cases of pruritus cannot be cured permanently without removal of the cause, symptomatic measures can be of

benefit in almost all cases, and, in many cases, even without knowledge or removal of the cause, symptomatic treatment will suffice to effect a cure

In outlining the treatment of pruritus, it seems to us best to follow the classification laid down by Rothman

Causal Therapy—As stated above, a detailed discussion is impossible, as it would extend far beyond the limits of this communication. The best results of causal therapy are achieved principally through antiparasitic measures in parasitic disease, through diet and insulin in diabetic pruritus, and through x ray treatment of the skin, spleen and lymph glands in leukemias and Hodgkin's disease. Moreover, in the case of malignant tumors, of gallstones, of prostatic hypertrophy etc, through the indicated medical and surgical treatment, and, in purely psychogenic (hysterical) pruritus, by psychotherapy. Other causal procedures promising excellent results are those in which the environmental causes, contact substances, food-inhalants and especially drugs can be found and removed, or those in which specific hyposensitization can be accomplished. In itching which appears during the period of sexual involution (menopause, etc) and particularly in pruritus vulvae at this time, injections of ovarian and anterior pituitary hormones have been recommended. This form of therapy may be causal and is well worthy of trial

Indirect Symptomatic Treatment—This group embraces those procedures which are directed neither against the primary cause, nor purely against the symptom but which influence some underlying factor or factors upon which the itching depends. These methods may be subdivided into (1) General measures (2) local measures. Under the general measures may be grouped (a) Procedures which influence the colloid equilibrium and (b) those which effect the balance of electrolytes. Such measures are usually of benefit in itching due to sensitizations and in that due to exogenous and endogenous toxins. In the procedures above referred to a colloidal therapy, Infusions of saline or glucose, so-called protein-alated other shock therapy, such as the injection of milk

milk preparations (aolan), turpentine and turpentine preparations (olobinthin)   Calcium therapy, enterally or parenterally, also belongs in this group, as does the injection of sodium —or calcium—thiosulphate

Of the methods here to be included, *autohemotherapy* has proved to be most efficacious in our hands   We have observed several cases of severe generalized pruritus, even though due to lymphogranulomatosis or inoperable abdominal malignancy, which have responded surprisingly well to this treatment   The procedure is simple and consists in the withdrawal of 15 to 20 cc of blood from the antecubital vein and immediate deep injection into the buttocks   The procedure can be repeated at two- to four-day intervals

Another method in this group is that which seeks to restore the balance in the autonomic nervous system   The vagotonia, which is not infrequently present, can be combated by the administration of ephedrine, adrenalin, atropine, etc   In cases in which sympatheticotonus seems to predominate, pilocarpine, physostigmine, yohimbin, and ergotamine tartrate may be employed   The practical procedure we follow is to try a member of one group of these drugs and, if the pruritus is not relieved (and especially if it becomes worse), to switch immediately to a member of the other antagonistic group

Of the many other methods which could be listed here, we should like to mention only generalized ultraviolet light and indirect x-ray treatment (of the skin surface), and treatments inducing hyperpyrexia both by physical methods, such as short-wave radiotherm, hot cabinets, and hot bath, and by chemical means, such as typhoid vaccine, injections of sulphur preparations (Bory), etc

General measures, which are therapeutics of the underlying disease process, usually also combat the accompanying pruritus   Arsenic, although not proved to be etiologic treatment, often helps materially in the treatment of not only psoriasis, lichen planus, neurodermites, of leukemias and of Hodgkin's disease, but also in the amelioration of the accompanying pruritus

Similarly, local chemical and p   antiphlogistics counterirritants, etc., which are used ir   p cal and symptomatic treatment of itching dermatoses   v have antipruritic effect. But they are not true anti   cs for their effectiveness in relieving the itching depends   n their effectiveness against the underlying morbid proc   For this reason, they must be properly chosen and suited to the treatment of the individual dermatoses Thus while mild irritant (chrysarobin, etc.) treatment will usually allay the itching of psoriasis or of a chronic neurodermitis, it will almost surely only intensify the pruritus of a highly inflamed and acute process, such as a weeping eczema or rhus dermatitis

Among the indirect symptomatic treatments of itching may be mentioned such highly effective measures as ultraviolet treatment. In the treatment of the pruritus of lichen planus, of diabetes, of pregnancy, and in some cases of pruritus vulvae et ani, of neurodermatitis and of chronic eczema, as well as in the generalized pruritus of Hodgkin's disease and of leukemias, we have had excellent results from both local and generalized ultraviolet treatments Suberythema doses, well below the amount necessary to cause the slightest redness, have proved the best in our hands Similar good effect may occasionally be observed from superficial x ray of the spine (Gonin and Bienvenue)

The local administration of x rays is the last method we wish to mention in this category, and it is in our opinion also the best. In most cases it outstrips all other procedures in the rapid amelioration and even cure of pruritus due to a multitude of causes This method is therefore the one of choice in most cases We refer specifically to the administration of fractional doses of unfiltered x ray with the technic advocated by MacKee and as it is today employed by almost all American dermatologists This form of local x ray has only two drawbacks (1) Its employment is limited to a certain maximum number of treatments to each given area an l (2) there are a very few cases of itching dermatoses which x ray not only does n t help but even tends to aggravate

Direct Symptomatic Treatment of Itching —Many of the methods employed here are of composite action and possess components which may have indirect symptomatic action or even causal effect   Nevertheless, direct symptomatic anti-pruritic measures may be more or less roughly classed in five categories, as follows

1 *Protective Measures Against Exogenous Stimuli Which May Produce Itching in a Skin with a Pathologically Altered Threshold of Irritability* —This measure is one of the most important, but also one of the most difficult   Scratching and rubbing must be prevented by all possible means   Moreover, the itching areas must be protected against outward stimuli, such as friction and changes of pressure and temperature This protection can be achieved by the use of properly pre-pared wet dressings, lotions, pastes, ointments, plasters, and bandages   It is here that not only the prescribing physician and the dispensing druggist, but also the nurse or other indi-vidual applying the remedy, must not fail to exercise the maxi-mum of skill   For the improper choice of ingredients or the improper compounding of the prescription and, perhaps still more important, the faulty application of the remedy can lead to disastrous results   For example, a remedy which is too cool-ing or too heating, or the use of an occlusive ointment on an exudative or weeping area on which a wet dressing, paste, or lotion would be preferable, may serve only to aggravate the itching   Furthermore, an ointment, paste, or lotion improperly mixed and of nonhomogeneous consistency will produce new stimuli and thus aggravate the pruritus   But still more im-portant is the proper application, for a wet dressing allowed to dry, a bandage which wrinkles and rubs, an ointment not properly applied and removed, will engender both friction and heat, and, instead of protecting, will elicit further damage

The bath is an excellent antipruritic because it is the pro-tective measure which is the simplest to apply and which obviates many of the above-mentioned difficulties , It should be sufficiently prolonged to bring relief, *i e* , at least one-half hour   The patient should be in a comfortable position and

without movement The temperature of both water and room must be constant, and the drying of the skin after the bath must be done carefully and without rubbing Of the various remedies to be added to the bath, we need mention here only starch, bran, oatmeal, and tar

It is very important to choose clothing of the proper mate rial and texture. Woolens and coarse materials almost always aggravate itching, and clothing which is too tight, too heating, or which protects insufficiently against outer changes of tem perature, should be avoided

Measures Which Reduce Itching Irritability Through Affecting the Peripheral End organs —All local anesthetics, when injected, stop not only pain but itching Unfortunately, their usefulness is here limited, for their action is of short dura tion, and they cannot penetrate the intact epidermis Certain water insoluble anesthetics, such as cycloform, orthoform, and benzocaine are of some slight value even when applied to the intact epidermis Benzocaine is probably the most efficacious, and it may be added to lotions and to pastes or ointments, up to 10 per cent However, not only do many cases fail to derive benefit, but these remedies all have a very strong tendency to sensitize and thus to produce itching eruptions For this reason they should not be used unless the patient can be in vestigated for hypersensitivity and watched throughout the period of usage *Phenol* is a useful antipruritic which prob ably also owes its action to its anesthetic qualities To avoid it should not be used in a concentration of more than 2

sensitization), these drugs often cause itching even in patients previously not affected by pruritus   Bromides and mild analgesics are more useful, and sometimes acetylsalicylic acid, phenobarbital, amidopyrine, etc , are of benefit   However, here again the dangers of sensitization and the aggravation of pruritus must be considered   Bromides may be given not only by mouth but by injection, and in our hands the intravenous injection of strontium bromide has occasionally given striking results   Many other drugs, such as valerian, cannabis indica, etc , have been recommended

4 *Measures Which Combat Itching by Means of Its Replacement by Other Sensations* —Scratching, rubbing, pinching, slapping, and the application of heat and cold are to be mentioned here   Menthol, one of the most widely used antipruritics, acts by producing a sensation of cold   Moreover, through the production of a mild sensation of cold, the blood vessels become constricted, and the threshold for itching is altered

5 *Measures Which Reduce Itching by Means of Psychogenic Effect upon Somatic Pruritus* —As we have stated before, every itching dermatosis, regardless of cause, may, to some degree, be amenable to psychotherapy   The proper method to be employed must be sought for in each case   It may vary from simple distraction to suggestion or psychoanalysis   The success of these measures depends on the degree of confidence which the physician inspires in the patient

*   *   *   *   *

In addition to all the therapeutic measures we have outlined, it is, of course, necessary to consider the general health and hygiene of the patient, to regulate the diet, exercise, bowel function, rest, and other habits and ways of life

In closing, we should like to emphasize that pruritus is of importance for two main reasons   First, because continuous pruritus and severe pruritus may in and of itself be one of the most horrible tortures which a patient can undergo, sometimes leading to a complete disintegration of the morale, and

occasionally to suicide. Only those who have seen a true
pruritic crisis, or who have treated many itching patients, or
who themselves have suffered from itching, can appreciate the
gravity of this affliction. But itching is important, not only in
itself but also because it may lead to the discovery of a seri-
ous underlying malady of which it may be the first mani-
festation. It is, therefore, obligatory that in all pruritus of
unknown cause the physician carefully investigate for the
presence of such morbid states as diabetes, liver disease, kid-
ney trouble, abdominal and other malignant tumors, and of
blood dyscrasias and Hodgkin's disease.

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by reflex constriction of the arteries   But unfortunately these beneficial effects are in part counteracted by dilatation of the capillaries which results in oozing of blood   We can increase the natural vasoconstrictive response by the local application of heat or of cold as first aid measures   It is for the same purpose, too, that adrenalin and astringents have come to be advocated as temporary local measures for the arrest of bleeding   This first natural defense, manifested by vascular constriction within the wounded tissue is but one of nature's methods of maintaining bodily integrity

The second defense against bleeding is the agglutination of blood platelets in the orifices of broken capillaries and small arterioles   As blood oozes through the site of the injured vessel wall the platelets condense about its opening and soon accumulate sufficiently to block the vessel and thereby partially arrest bleeding   Not only do the platelets span a transient barrier to the continued flow of blood through the injured vessel, but those remaining in the flowing blood disintegrate rapidly to increase the toughness of the clot on the one hand and promote additional vasoconstriction of the local vascular site on the other

The third defense is the increased coagulability of the blood actually induced as a result of bleeding   This is due to the passage of tissue juices into the blood stream locally which accelerate clot formation   It is to be remembered that all living tissues clot once they begin to disintegrate, and each tissue has its own content of clotting substances   Tissue clotting reinforces the striking property of the blood to clot in its passage through them during injury   Blood oozing through injured muscle or subcutaneous tissue clots more readily than through injured mucous membrane   Each tissue has its own function for the protection of the body against loss of "life" blood   Finally, the most important defense is the actual coagulation of blood in wounds   This is the end-result of the passage of blood through injured tissue and is the most effective barrier against continued blood flow

Blood shed from a wound has the unique property of

transforming soluble fibrinogen into insoluble fibrin. The first visible sign of clotting in shed blood is the formation of filaments on the surface exposed to the air. Dark field illumination reveals acicular crystals which are doubly refractile. These coalesce into threads and long needles which together form a network of fibrin. It is white, tough and elastic as it normally contracts from the blood about it. It is the separation of such resistant fibrin from the congealed blood that makes the arrest of bleeding possible.

THE BLOOD CLOTTING MECHANISM

Contact Catalyst Ca +

(Prothrombin) — — — (Thrombin)
(Serum)

+ ← — — + } (Fibrin)
(Antithrombin)

Organic
(Platelet) (Fibrinogen)
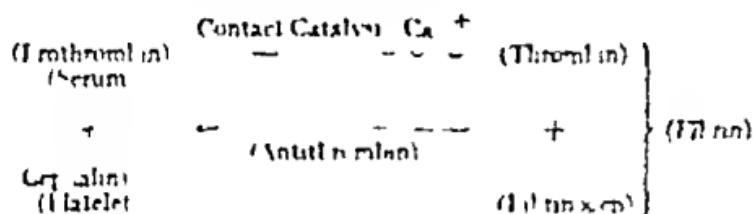
Fibrin formation results from colloidal changes occurring among certain well-defined blood clotting constituents. The retraction of the formed fibrin represents the last stage of the clotting process. But the chemical changes occurring preliminary to this gelling of blood constitute the preclot period. It is during this so-called incubation period that the plasma dissociates into substances which react to produce a gel. A protein substance, prothrombin, forms from the dissociation of the plasma by the action of the debris of blood platelets. The product is an electronegatively charged thrombin which acts as a nucleus for the condensation of fibrinogen as catalyzed by the presence of calcium ions. There are a continuum of micellae formed throughout the mass of blood plasma and in the wound. The resulting gel is hydrous, viscous and honeycomb in structure. And the desired retraction of fibrin from the congealed blood is brought about by the action of the disintegrated platelets upon the fibrin gel.

in the blood in combined form   The stable plasma complex must dissociate as shed before its disintegration products can unite to form a clot   And contact of blood with foreign bodies markedly increases plasma dissociation   But beside the stability of the plasma-making substances unavailable in the circulating blood, the liver secretes antithrombin which in combination with prothrombin prevents intravascular clotting When blood is shed, platelets or tissue disintegration furnishes a lipid substance, cephalin, which combines with the antithrombin thus liberating prothrombin, nature's means of maintaining blood fluidity in vivo is by keeping the clotting substances combined in stable solution   Once the vital conditions are disturbed disintegration results and clotting becomes the last stage of the living process

When blood is deficient in a clotting constituent the patient suffers from hemorrhagic disease   If the prothrombin is diminished at birth hemorrhagic disease of the newborn becomes manifest   If the blood platelets are defective, persisting in stability and failing in disintegration, hemophilia characterizes the hereditary bleeding tendency   If the blood platelets suddenly diminish in number thrombocytopenic purpura precipitates   If the blood fibrinogen is decreased in concentration hemorrhagic symptoms become associated with the prevailing disease of the liver   And so is each hemorrhagic disease necessarily a consequence of disturbed blood clotting function

But there are hemorrhagic diseases with normal blood clotting constituents   The bleeding symptoms in these patients result from a disturbance in their vascular system   Thus does normal blood ooze through impaired vascular channels as an indication of their involvement   And each type of vascular injury causes a specific hemorrhagic syndrome   If the dietary has been deficient in vitamin C the vascular endothelium suffers and scurvy is the consequence   If an allergic patient acquires an infection which invades his vascular structure, an allergic purpura follows   If an acute infectious disease involves the vascular endothelium an athrombopenic purpura

becomes a complication   And so does any offense to the vascu
lar system result in hemorrhagic syndromes even though the
blood be normal

We have approached the hemorrhagic status of a patient
from the standpoint of blood clotting function   It is the ratio
of the substances, prothrombin, fibrinogen and effective plate
lets over the antithrombin content of the blood   An index of
about 0 5 we have found normal   One greater than this tends
toward potential thrombosis and one below this value tends
toward bleeding   The index of the blood clotting function has
been a valuable guide not only in the diagnosis of hemorrhagic
disturbances but as well in determining the value of therap-
eutic agents advanced for hemorrhagic diseases   We have
come to appreciate that diet plays a considerable role in affect
ing the hemorrhagic status of a patient

factors insofar as they alter these blood constituents In experimental animals, for example, we have observed a rise in the index with protein and fat ingestion after a twenty-four-hour feeding period followed by a fall in the index of blood clotting function on a diet of carbohydrates, fruits and vegetables This trend toward a clotting index on high protein and fat diets led us to devise a so-called "clotting" dietary And vice versa the tendency of the blood to shift toward a low index of clotting function led us likewise to formulate a "bleeding" diet Children diagnosed as pseudohemophilia have responded most favorably to such "clotting" diets On the other hand the "bleeding" diets have been found effective preoperatively in those patients tending toward thrombosis as predicted by the high index of blood clotting function

THE INDEX OF CLOTTING FUNCTION

$$\begin{pmatrix} \text{Prothrombin} \\ + \\ \text{Fibrinogen} \end{pmatrix} + \text{Platelets} \rightleftharpoons \text{Antithrombin}$$
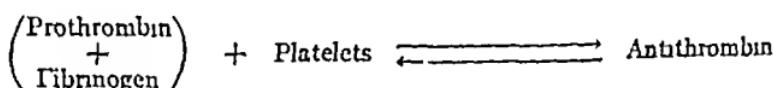
Expressing this reaction in terms of the law of mass action, we have

$$\frac{(\text{Prothrombin}) \times (\text{Fibrinogen}) \times (\text{Platelets})}{(\text{Antithrombin})} = 1$$

Introducing normal values for these substances

$$
\begin{aligned}
\text{Prothrombin} &= 1 \\
\text{Fibrinogen} &= 0.5 \text{ per cent} \\
\text{Platelets} &= 200{,}000 \\
\text{Platelet lysis} &= 50 \text{ per cent in one hour} \\
\text{Active platelets} &= 100{,}000 \\
\text{Antithrombin} &= 1.0
\end{aligned}
$$

The normal index of clotting function of blood is, therefore 0.5 ± 0.3 Values over 1.0 indicate a marked tendency to clot and values below 0.2 indicate a marked tendency to bleed

THE EFFECT OF HIGH PROTEIN DIET ON THE BLOOD CLOTTING FUNCTION

Protein source	Prothrombin.	Fibrinogen.	Antithrombin.	Platelets.			Diet
15% casein	0.4	0.10	3.5	365 000	45	0.014	8.70
	0.5	0.20	3.0	465 000	48	0.016	8.23
11% klim 33% lima beans	0.5	0.2	3.0	535 000	53	0.016	8.3
33% klim	1.0	0.42	1.0	490 000	4	0	8.46
33% brain	1.0	0.36	1.0	120 000	30	0.35	9.6
	2.0	0.32	1.0	100 000	3	0.6	1.18
33% lung	1.0	0.34	1.0	100 000	30	0	9.7
	2.0	0.36	1.0	200 000	40	0	12.18
33% liver	1.0	0.25	1.0	500 000	4	0.3	8.35
	1.0	0.42	1.0	725 000	41	0.3	07.6
	1.0	0.42	1.0	600 000	45	0.5	11
33% klim 66% whole wheat	1.0	0.42	1.0	500 000	41	0.3	9.7
	2.0	0.42	1.0	550 000	50	0	11.2
	2.0	0.42	1.0	500 000	8	0.5	1.91
33% beef	1.0	0.39	1.0	350 000	3	0.4	9.3
	1.5	0.42	0.75	500 000	30	0.5	11.2
	2.0	0.42	0.5	440 000	41	1.0	1
15% bone marrow 12% casein	1.0	0.4	1.0	450 000	4	0.3	3
	1.0	0.49	1.0	600 000	40	0.3	11.12
	2.0	0.54	0.5	540 000	40	0.3	1

POTENTIAL HEMORRHAGIC DISTURBANCES

Increase in Blood Clotting Function on a High Protein Dietary (one month interval)

Case.	Pro-thrombin.	Fibrinogen	Anti thrombin	Platelets	Lysis	Index
A J	0 6 0 8	0 36 0 64	1 4 1 0	210,000 350,000	33 40	0 1 0 5
B S	0 6 1 0	0 37 0 64	2 2 1 0	260,000 325,000	19 38	0 1 0 6
A S	0 01 0 9	0 56 0 75	10 5 1 0	260,000 275,000	10 34	0 01 0 7
H R	0 6 0 9	0 6 0 6	1 5 1 0	150,000 200,000	37 37	0 1 0 4
J T	0 8 1 0	0 32 0 37	1 1 1 0	350,000 350,000	30 30	0 2 0 3
M M	0 6 0 8	0 3 0 5	1 2 1 0	170,000 190,000	27 31	0 2 0 5
A H	0 6 0 9	0 6 0 6	1 5 1 0	175,000 190 000	37 31	0 2 0 5
M O	0 8 0 8	0 28 0 6	1 0 1 0	340,000 345,000	50 48	0 2 0 4
F M	0 6 0 8	0.3 0 5	1 2 1 0	150,000 230,000	27 30	0 2 0 5

Patients previously considered "pseudohemophilics" relieved of their bleeding tendency in high protein and fat dietary   Blood showed diminution in protein constituents—prothrombin, fibrinogen and antithrombin—involved in the clotting process   Capillary resistance normal

DIET TO DECREASE CLOTTING FUNCTION OF THE BLOOD

Calories 2000   Protein 25 Gm per kilo   Fat low
              Basic reactions   Water high

5 per cent	75 per cent	20 per cent	
P,	C,	Γ,	H₂O
18 Gm.	360 Gm	47 Gm	1176 cc

Adult—70 kilo

Food	Measurements	Protein	Carb	Fat	Calcium	Acid.	Base.	Vitamin.	H₂O
Breakfast Fresh fruit	Gener ous serv ing	2 0	31 8	1 2	150 0		14 0	ABC	217
Honey	2 tbsp	0 2	48 7		200 0			AB	11
Cereal	6 tbsp	2 5	10 0	1 1	61 0	2		ABCE	14
Cream	2 tbsp	0 8	1 4	5 5	60 3			ABCE	22
Coffee and sugar	2 tbsp		25 0		100 0				
Dinner Spinach	Serving	1 3	3 9	0 3	24 0		27 0	ABCG	92
Celery	Small serv ing	0 7	2 0	0 2	12 9		3 9	ABC	48
Potato	Small	1 9	15 7	0 1	73 1		5 25	ABC	59
Butter	2 pats			17 0	158 0			ABDG	2
Fruit	Gener ous serv ing	2 0	31 8	1 2	150 0		14 0	ABC	217
Honey	2 tbsp	0 2	48 7		200 0			AB	11
Tea and sugar	2 tbsp		25 0		100 0				
Supper Asparagus	Serving	1 3	3 9	0 3	24 0		8 0	B	94
Cauliflower	Serving	1 3	3 9	0 3	24 0		5 3	AB	92
Butter	2 pats			17 0	158 0			ABDG	2
Tomatoes—raw	Small serving	0 7	2 0	0 1	12 9		2 8	ABC	48
Lettuce—raw	Small serv ing	0 7	2 0	0 1	12 9		3 7	ABCDEG	48
Fruit	Gener ous serv ing	2 0	31 8	1 2	150 0		14 0	ABC	200
Honey	2 tbsp	0 2	48 7		200 0			AB	11
Tea and sugar	2 tbsp		25 0		100 0				
Total		17 5	361 3	45 6	1971 0	2	90 8		1176

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